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The probable cause is use of unlimited truncation. Revise your search strategy to use limited truncation.

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Search Results - Record(s) 1 through 10 of 13 returned.

☐ 1. Document ID: US 20030033073 A1

Using default format because multiple data bases are involved.

L11: Entry 1 of 13 File: PGPB Feb 13, 2003

PGPUB-DOCUMENT-NUMBER: 20030033073
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030033073 A1

TITLE: Vehicle brake control system

PUBLICATION-DATE: February 13, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Kichima, Yutaka	Wako-shi		JP
Bessho, Makoto	Wako-shi		JP
Takei, Katsuyuki	Wako-shi		JP

US-CL-CURRENT: 701/96; 701/93

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KMC | Draw De

☐ 2. Document ID: US 20020177935 A1

L11: Entry 2 of 13 File: PGPB Nov 28, 2002

PGPUB-DOCUMENT-NUMBER: 20020177935
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020177935 A1

TITLE: Tracking and driving speed regulating device for motor vehicles

PUBLICATION-DATE: November 28, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Winner, Hermann	Bietigheim		DE

Koenig, Winfried Pfinztal DE

US-CL-CURRENT: 701/93; 180/170

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 3. Document ID: US 6681170 B2

L11: Entry 3 of 13 File: USPT Jan 20, 2004

US-PAT-NO: 6681170
DOCUMENT-IDENTIFIER: US 6681170 B2

TITLE: Tracking and driving speed regulating device for motor vehicles

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

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☐ 4. Document ID: US 6473000 B1

L11: Entry 4 of 13 File: USPT Oct 29, 2002

US-PAT-NO: 6473000
DOCUMENT-IDENTIFIER: US 6473000 B1

TITLE: Method and apparatus for measuring and recording vehicle speed and for storing related data

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

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☐ 5. Document ID: US 6374173 B1

L11: Entry 5 of 13 File: USPT Apr 16, 2002

US-PAT-NO: 6374173
DOCUMENT-IDENTIFIER: US 6374173 B1

TITLE: Terrain adaptive cruise control

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

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☐ 6. Document ID: US 6067496 A

L11: Entry 6 of 13 File: USPT May 23, 2000

US-PAT-NO: 6067496
DOCUMENT-IDENTIFIER: US 6067496 A

TITLE: Automatic driver system, and a method of generating a speed reference in such a system

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 7. Document ID: US 6052644 A

L11: Entry 7 of 13 File: USPT Apr 18, 2000

US-PAT-NO: 6052644
DOCUMENT-IDENTIFIER: US 6052644 A

TITLE: Apparatus and method for limiting vehicle speed of a working vehicle

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 8. Document ID: US 5835878 A

L11: Entry 8 of 13 File: USPT Nov 10, 1998

US-PAT-NO: 5835878
DOCUMENT-IDENTIFIER: US 5835878 A

TITLE: Vehicle speed control system

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 9. Document ID: US 5758306 A

L11: Entry 9 of 13 File: USPT May 26, 1998

US-PAT-NO: 5758306
DOCUMENT-IDENTIFIER: US 5758306 A

TITLE: Vehicle cruise control system

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 10. Document ID: US 5243523 A

L11: Entry 10 of 13 File: USPT Sep 7, 1993

US-PAT-NO: 5243523
DOCUMENT-IDENTIFIER: US 5243523 A

TITLE: Method and device for computing a stabilized vehicle speed value from a pulse signal

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L10 and shift$	13

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L11: Entry 3 of 13 File: USPT Jan 20, 2004

US-PAT-NO: 6681170
DOCUMENT-IDENTIFIER: US 6681170 B2

TITLE: Tracking and driving speed regulating device for motor vehicles

DATE-ISSUED: January 20, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Winner; Hermann	Bietigheim			DE
Koenig; Winfried	Pfinztal			DE

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Robert Bosch GmbH	Stuttgart			DE	03

APPL-NO: 10/105703 [PALM]
DATE FILED: March 25, 2002

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
DE	101 14 470	March 24, 2001

INT-CL-ISSUED: [07] H04 N 7/18

US-CL-ISSUED: 701/93; 701/41, 701/91, 340/465, 180/204
US-CL-CURRENT: 701/93; 180/204, 340/465, 701/41, 701/91

FIELD-OF-CLASSIFICATION-SEARCH: 701/93, 701/96, 701/301, 701/72, 701/41, 342/29, 342/104, 342/109, 340/902, 340/903, 340/435, 340/436, 340/444, 340/441, 340/465, 340/467, 340/459, 340/995, 340/460, 340/901, 340/905, 340/525, 180/170, 180/282, 180/169, 180/443, 180/446, 180/204, 345/173, 345/156, 345/157, 345/163
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5245422	September 1993	Borcherts et al.	358/103
5871062	February 1999	Desens et al.	180/169

☐	6219604	April 2001	Dilger et al.	701/41
☐	6353788	March 2002	Baker et al.	701/96
☐	6370471	April 2002	Lohner et al.	701/96
☐	6373400	April 2002	Fujita et al.	340/901
☐	6373472	April 2002	Palalau et al.	345/173
☐	2001/0025211	September 2001	Shirai et al.	701/1
☐	2002/0138193	September 2002	Miyahara	701/96

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
61 009709	January 1986	JP	
20 00168395	June 2000	JP	

ART-UNIT: 3663

PRIMARY-EXAMINER: Black; Thomas G

ASSISTANT-EXAMINER: To; Tuan C

ATTY-AGENT-FIRM: Kenyon & Kenyon

ABSTRACT:

A tracking and driving speed regulating device for motor vehicles, having a sensor device for detecting lane tracking, a steering regulator for evaluating signals from sensor device and for issuing steering commands to a steering actuator, and a speed regulator, acting upon the driving system of the vehicle, which may be switched to an operating state by a main switch and may be activated in the operating state by an actuation signal generated by an operating element., wherein the steering regulator may be switched to the operating state by a separate main switch independent of the speed regulator, and may be activated in the operating state by the same actuation signal as the speed regulator.

30 Claims, 2 Drawing figures

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L11: Entry 4 of 13 File: USPT Oct 29, 2002

DOCUMENT-IDENTIFIER: US 6473000 B1
TITLE: Method and apparatus for measuring and recording vehicle speed and for storing related data

Application Filing Date (1):
20011024

DATE ISSUED (1):
20021029

Brief Summary Text (14):
It is an object of the present invention to provide a Microsoft Windows.RTM.-based speed timing and tracking system, for use in a portable computer device, that calculates the velocity of a moving vehicle in miles per hour.

Detailed Description Text (10):
The system is a Microsoft Windows.RTM.-based speed timing and tracking device to facilitate the following: calculate the velocity of a moving vehicle along a roadway; indicate to an officer visually and audibly when a vehicle is exceeding the speed limit; capture speed time trial data for statistical reporting and citation purposes; and store the captured data in a common format such as, for example, the popular Microsoft.RTM. Access database. (Many other commercially available database formats can be employed, and the example given is not intended to limit the database applications that may be interfaced with the program disclosed herein.) Certain historical reports are provided with the package. Customized reports may also be designed by the end user.

Detailed Description Text (27):
Referring next to FIGS. 4 and 5, a flow chart 310 shows the sequence in which the start button is processed. A manual input 312 signifies that the start button has been pressed. The system time is instantaneously captured 314 using the timeGetTime.TM. utility described above, or any other similar program. In a next step 316, the system decides whether the officer field is populated (i.e., has an officer been selected?). If not, the system prompts the user to select an officer from a drop-down list 318 before pressing the manual start button 312. If an officer has already been selected, the program then decides whether the location field is also populated 320. If not, the system prompts the user to select a location from a drop-down list 322 before pressing the start button 312. If the location and officer fields are both populated, the graphic user interface 210 displays the elapsed time 324 to the second decimal point or to the hundredths of a second. The display 210 then continues counting elapsed time until a manual stop button 412 is pressed.

Detailed Description Text (33):
Referring next to FIG. 6, an associated program comprises the logic steps shown in a flowchart in order to provide identification of the geographical location. The first step of generating the location ID table is generally designated as step 50. At step 52, a location database is defined comprising a plurality of field designations. The next step 54 is to assign an identification number associated with each individual geographic location. The next step 56 is to provide a

description of the location indicating, for example, the street name and intersection and if applicable, the direction of travel of the lanes which are being monitored. In the next step 58, a set distance for the pre-measured course is associated with the specific location so as to automatically provide the distance value of the pre-measured course, which is associated with a given location ID. The next step 60 is to enter a buffered speed limit, which may or may not be equal to the legal speed limit associated with the location. After entering the buffered speed, at step 62, the legal speed limit is entered. Finally, step 64 is to provide the operator the option of DONE. If the response is NO, the program returns to the initial step 52 to set up another geographic location identifier. Thus, the steps set forth in flowchart 50 in FIG. 6 provide a preset value which can be associated with a location ID in a program sequence 10 at step 14 which when inserted will automatically provide location and distance information for steps further down the sequence. Because the distances are pre-entered, an officer cannot mistakenly enter a wrong distance for a location.

Detailed Description Text (38):
When the operator exits out of the program, all data is automatically saved. At the end of an officer's shift, this history is copied to a diskette and put into a back-office database program by the department's administrator. After a period of time of entering all officers' diskettes into the base program, a variety of statistics can be obtained. Information saved in the file history may include the following: i. the number of clocks at a particular location; ii. the time of day the clocks are being made; iii. the speeds at which officers are issuing citations; iv. the time of day the fastest speeds are being recorded; v. how many vehicles a particular officer is clocking; vi. what the average speed is at a particular location; and vii. what times an officer is doing the clocking.

Detailed Description Text (39):
Information can also be obtained for a particular officer, shift, day, week, month or year. The gathered information can assist administrators in the evaluation on how to effectively enforce traffic regulations.

Current US Cross Reference Classification (2):
701/93

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L11: Entry 4 of 13 File: USPT Oct 29, 2002

US-PAT-NO: 6473000
DOCUMENT-IDENTIFIER: US 6473000 B1

TITLE: Method and apparatus for measuring and recording vehicle speed and for storing related data

DATE-ISSUED: October 29, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Secreet; James	McDonald	PA	15057	
Capo; David Richard	Coraopolis	PA	15108	
Ohliger, III; Herbert H.	Carnegie	PA	15106	

APPL-NO: 09/999728 [PALM]
DATE FILED: October 24, 2001

PARENT-CASE:
RELATED APPLICATIONS There are no applications related to this invention anywhere in the world.

INT-CL-ISSUED: [07] G08 G 1/01

US-CL-ISSUED: 340/936; 340/933, 701/93
US-CL-CURRENT: 340/936; 340/933, 701/93

FIELD-OF-CLASSIFICATION-SEARCH: 340/936, 340/905-933, 701/93
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
D355616	February 1995	Gregg, III et al.	
5510793	April 1996	Gregg, III et al.	
5572450	November 1996	Worthy	
5935190	August 1999	Davis et al.	
5948038	September 1999	Daly et al.	
5977884	November 1999	Ross	

☐	6011515	January 2000	Radcliffe et al.	342/453
☐	6040766	March 2000	Lubke et al.	340/438
☐	6121898	September 2000	Moetteli	
☐	6163277	December 2000	Gehlot	
☐	6163742	December 2000	Shimizu	
☐	6166658	December 2000	Testa	701/93
☐	6201493	March 2001	Silverman	
☐	6208268	March 2001	Scarzello et al.	
☐	6265989	July 2001	Taylor	340/901

ART-UNIT: 2632

PRIMARY-EXAMINER: Pope; Daryl

ATTY-AGENT-FIRM: Smith; William P. DKW Law Group, P.C.

ABSTRACT:

A computer program product for speed limit enforcement is executable on a portable computer to measure the elapsed time it takes a motor vehicle to traverse a premeasured course along a roadway. The start and stop signals are manually input by a traffic officer via assigned keys on a keyboard, to capture the time interval between the last start signal and the stop signal. A start signal is entered upon a vehicle crossing a first measurement line, and a stop signal is entered upon the vehicle's crossing a second measurement line, the distance between the lines having been preselected from a set of geographic location data. The program converts the time measurement to the relevant units, typically miles per hour, for comparison to a threshold limit stored in a buffer. The time trial is displayed on the computer screen and each record is stored in a cumulative relational database for upload to a back office system for generating historical and statistical reports. The program is useful for enforcement of traffic speed limit laws and collection of evidentiary data.

21 Claims, 6 Drawing figures

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L11: Entry 5 of 13 File: USPT Apr 16, 2002

DOCUMENT-IDENTIFIER: US 6374173 B1
TITLE: Terrain adaptive cruise control

Application Filing Date (1):
19990528

DATE ISSUED (1):
20020416

Detailed Description Text (63):
Accordingly, one implementation illustrated at FIG. 7 tracks the vehicle's road speed and cruise set speed (step 252), tracks elevation gain (step 254), and tracks acceleration gain (step 256) by periodically computing variables from the vehicle performance parameters. The system can then determine if the vehicle's road speed is lagging behind the cruise set speed; whether there was sufficient elevation gain; and whether the vehicle's acceleration has been substantially consistently increasing (step 258). If so, it is determined that the vehicle is cresting a hill, and a terrain adaptive action is taken (e.g., adjusting the cruise control) (step 262).

Detailed Description Text (67):
For example, an implementation shown in FIG. 8 checks to see if the cruise control system is active (step 302), whether the vehicle speed is lagging behind the cruise set speed (step 304), whether the transmission is being shifted (step 306), and whether the vehicle has gained a particular amount of elevation (step 308). Depending on the outcome of its analysis, the system then determines whether there has been an appropriate predetermined acceleration gain (step 310). If so, the fuzzy logic variable is incremented (step 312); otherwise, the variable is decremented (step 314). If the fuzzy logic variable exceeds the threshold (step 320), the system sends an alert (step 322). In the illustrated embodiment, the threshold is set to a predetermined integer (e.g., 9); however, the threshold could be implemented as an input parameter to facilitate system tuning. The fuzzy logic system can also be tuned by adjusting the predetermined acceleration gain, which in a preferred embodiment is represented by a pair of input parameters. For example, decreasing the predetermined acceleration gain would make the system more sensitive to acceleration gains when determining whether the vehicle is cresting a hill.

Detailed Description Text (81):
The ratio shift indicator is then calculated as follows. If the derived vehicle road speed is greater than the low speed limit and the vehicle engine ratio has not changed by more than 3% (step 560), RSI is set to 1 to indicate the transmission is not being shifted (step 568); otherwise RSI is set to 0 to indicate the transmission is being shifted (step 570).

Detailed Description Text (82):
If the transmission is not being shifted (step 572), the vehicle engine ratio is calculated as a weighted average between the current value and the value during the previous iteration, with a 10% and 90% weighting, respectively (step 574). The average operates to provide a smoothed value for the vehicle engine ratio.

Detailed Description Text (92):
The acceleration of the vehicle is then calculated as follows. If the cruise control is active; the derived vehicle road speed is over 35 miles per hour; the derived vehicle road speed is lagging at least 2 miles per hour behind the cruise set speed; the increase in elevation is at least 100 feet; and the transmission is not being shifted (step 622), the acceleration is calculated according to the following formula (step 624):

Detailed Description Text (133):
In addition, the driver training method can be applied to the fuel use efficiency system described in U.S. patent application Ser. No. 08/982,117 to Ehlbeck et al. entitled, "Fuel Use Efficiency System for Assisting the Driver to Improve Fuel Economy," previously incorporated by reference. The training system can be implemented in a variety of other applications such as accident avoidance applications (e.g., advising when the vehicle is following another too closely) and brake monitoring (e.g., to avoid hard braking or excessive downhill braking). Other applications include monitoring off-tracking, advising of slippery road conditions, determining when a vehicle's air suspension is improperly deflated, or warning when roll stability is outside specified bounds. Since the training system operates in the vehicle itself, it is sometimes called an "on-board driver training system."

Detailed Description Paragraph Table (2):
TABLE 2 Variable Description Cruise value of bit eight of PID85: one if cruise control is activated (on) and zero if cruise control is inactive (off). CSMPH the cruise set speed in miles per hour. If cruise control is not activated, the value of CSMPH is zero. CSp the cruise set speed from the previous iteration. The initial value of CSp is zero. CSp is then set dynamically at the start of each iteration before CSMPH is updated with current values. Delev change in vehicle's elevation (in feet) since last zeroed. Initial value is zero. ggain an input parameter which specifies the percentage amount of increase in the acceleration needed to indicate that the vehicle is nearing the crest of a vertical curve. In the current implementation, this value is set to 1.04. gLim an input parameter which specifies an absolute acceleration which indicates that the vehicle is nearing the crest of a vertical curve. In the current implementation, this value is set to 0.05. Gr Grade of the roadway in percent as estimated by the Vehicle Parameters Estimator (VPE) algorithm. VPE operates asynchronously to the terrain adaptive cruise control system and estimates the vehicle's gross weight, aerodynamic drag and the grade of the roadway on which the vehicle is currently operating. gs the acceleration of the vehicle when the specified conditions are met. Otherwise, gs is set equal to zero. Calculated using RPM - RPMp to utilize the increased speed resolution provided by PID 190. gsp digitally smoothed previous iteration vehicle acceleration (in g's) calculated recursively as shown in FIG. 15. If the current vehicle acceleration is not greater than zero, the value of gsp is set equal to zero, its initial startup value. LSLim Low Speed Limit, a low speed cut out value in miles per hour. Initially set to 25 mph. MPH derived vehicle road speed in miles per hour. PCM previous cruise message. PCM equal to zero corresponds to no cruise message during the previous iteration. PCM equal to one corresponds to a change in the cruise set speed since the previous iteration. PCM equal to two corresponds to a current terrain adaptive cruise event. This variable serves to sustain display of a driver message. PID an array which contains the most recent information for PIDs 0 through 253 from the J1587/1708 data bus for MID 128 (Engine). This array is updated by the INPUT module 120 and serves as a parameter store. RPM derived vehicle engine speed in revolutions per minute RPMp digitally smoothed previous iteration engine RPM calculated recursively as shown in FIG. 15. If the current engine RPM is not greater than 300 revolutions per minute, the value of RPMp is set equal to zero (i.e., the initial startup value). RSI ratio shift indicator; set to 1 when transmission is not being shifted (i.e., the ratio of the derived vehicle road speed divided by the engine RPM is nearly constant). TAC fuzzy logic global variable used to determine if the vehicle is about to encounter a downgrade. The initial or startup value of TAC is zero. VEr Vehicle Engine ratio. Initial value is

set at 0.03. VErp "previous" value of VEr from previous iteration. VErp is set dynamically by reading VEr from memory at the start of each iteration before VEr is updated with current values.

Current US Original Classification (1):
701/93

CLAIMS:

20. A method for adapting operation of a vehicle to terrain variation while operating the vehicle on a roadway, the method comprising:

maintaining a cruise set speed for the vehicle;

deriving a vehicle road speed, a vehicle engine speed, a ratio of the vehicle road speed to the vehicle engine speed, a change in vehicle elevation, a grade of the roadway, and a vehicle acceleration from sensors on the vehicle;

determining whether the vehicle's transmission is being shifted;

determining whether a degree of confidence variable should be manipulated by analyzing whether the grade of the roadway is an upward grade, whether the vehicle road speed is lagging behind the cruise set speed, whether the transmission is being shifted, and whether the change in vehicle elevation is greater than a predetermined amount;

when it is determined the degree of confidence variable should be manipulated, analyzing whether the vehicle acceleration has increased over a predetermined amount to determine whether to increment or decrement the degree of confidence variable; and

displaying a message advising manipulation of the cruise control system on a driver-viewable display when the degree of confidence variable exceeds a predetermined threshold.

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L11: Entry 5 of 13 File: USPT Apr 16, 2002

DOCUMENT-IDENTIFIER: US 6374173 B1
TITLE: Terrain adaptive cruise control

Application Filing Date (1):
19990528

DATE ISSUED (1):
20020416

Detailed Description Text (63):
Accordingly, one implementation illustrated at FIG. 7 tracks the vehicle's road speed and cruise set speed (step 252), tracks elevation gain (step 254), and tracks acceleration gain (step 256) by periodically computing variables from the vehicle performance parameters. The system can then determine if the vehicle's road speed is lagging behind the cruise set speed; whether there was sufficient elevation gain; and whether the vehicle's acceleration has been substantially consistently increasing (step 258). If so, it is determined that the vehicle is cresting a hill, and a terrain adaptive action is taken (e.g., adjusting the cruise control) (step 262).

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For example, an implementation shown in FIG. 8 checks to see if the cruise control system is active (step 302), whether the vehicle speed is lagging behind the cruise set speed (step 304), whether the transmission is being shifted (step 306), and whether the vehicle has gained a particular amount of elevation (step 308). Depending on the outcome of its analysis, the system then determines whether there has been an appropriate predetermined acceleration gain (step 310). If so, the fuzzy logic variable is incremented (step 312); otherwise, the variable is decremented (step 314). If the fuzzy logic variable exceeds the threshold (step 320), the system sends an alert (step 322). In the illustrated embodiment, the threshold is set to a predetermined integer (e.g., 9); however, the threshold could be implemented as an input parameter to facilitate system tuning. The fuzzy logic system can also be tuned by adjusting the predetermined acceleration gain, which in a preferred embodiment is represented by a pair of input parameters. For example, decreasing the predetermined acceleration gain would make the system more sensitive to acceleration gains when determining whether the vehicle is cresting a hill.

Detailed Description Text (81):
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Detailed Description Text (92):
The acceleration of the vehicle is then calculated as follows. If the cruise control is active; the derived vehicle road speed is over 35 miles per hour; the derived vehicle road speed is lagging at least 2 miles per hour behind the cruise set speed; the increase in elevation is at least 100 feet; and the transmission is not being shifted (step 622), the acceleration is calculated according to the following formula (step 624):

Detailed Description Text (133):
In addition, the driver training method can be applied to the fuel use efficiency system described in U.S. patent application Ser. No. 08/982,117 to Ehlbeck et al. entitled, "Fuel Use Efficiency System for Assisting the Driver to Improve Fuel Economy," previously incorporated by reference. The training system can be implemented in a variety of other applications such as accident avoidance applications (e.g., advising when the vehicle is following another too closely) and brake monitoring (e.g., to avoid hard braking or excessive downhill braking). Other applications include monitoring off-tracking, advising of slippery road conditions, determining when a vehicle's air suspension is improperly deflated, or warning when roll stability is outside specified bounds. Since the training system operates in the vehicle itself, it is sometimes called an "on-board driver training system."

Detailed Description Paragraph Table (2):
TABLE 2 Variable Description Cruise value of bit eight of PID85: one if cruise control is activated (on) and zero if cruise control is inactive (off). CSMPH the cruise set speed in miles per hour. If cruise control is not activated, the value of CSMPH is zero. CSp the cruise set speed from the previous iteration. The initial value of CSp is zero. CSp is then set dynamically at the start of each iteration before CSMPH is updated with current values. Delev change in vehicle's elevation (in feet) since last zeroed. Initial value is zero. ggain an input parameter which specifies the percentage amount of increase in the acceleration needed to indicate that the vehicle is nearing the crest of a vertical curve. In the current implementation, this value is set to 1.04. gLim an input parameter which specifies an absolute acceleration which indicates that the vehicle is nearing the crest of a vertical curve. In the current implementation, this value is set to 0.05. Gr Grade of the roadway in percent as estimated by the Vehicle Parameters Estimator (VPE) algorithm. VPE operates asynchronously to the terrain adaptive cruise control system and estimates the vehicle's gross weight, aerodynamic drag and the grade of the roadway on which the vehicle is currently operating. gs the acceleration of the vehicle when the specified conditions are met. Otherwise, gs is set equal to zero. Calculated using RPM - RPMp to utilize the increased speed resolution provided by PID 190. gsp digitally smoothed previous iteration vehicle acceleration (in g's) calculated recursively as shown in FIG. 15. If the current vehicle acceleration is not greater than zero, the value of gsp is set equal to zero, its initial startup value. LSLim Low Speed Limit, a low speed cut out value in miles per hour. Initially set to 25 mph. MPH derived vehicle road speed in miles per hour. PCM previous cruise message. PCM equal to zero corresponds to no cruise message during the previous iteration. PCM equal to one corresponds to a change in the cruise set speed since the previous iteration. PCM equal to two corresponds to a current terrain adaptive cruise event. This variable serves to sustain display of a driver message. PID an array which contains the most recent information for PIDs 0 through 253 from the J1587/1708 data bus for MID 128 (Engine). This array is updated by the INPUT module 120 and serves as a parameter store. RPM derived vehicle engine speed in revolutions per minute RPMp digitally smoothed previous iteration engine RPM calculated recursively as shown in FIG. 15. If the current engine RPM is not greater than 300 revolutions per minute, the value of RPMp is set equal to zero (i.e., the initial startup value). RSI ratio shift indicator; set to 1 when transmission is not being shifted (i.e., the ratio of the derived vehicle road speed divided by the engine RPM is nearly constant). TAC fuzzy logic global variable used to determine if the vehicle is about to encounter a downgrade. The initial or startup value of TAC is zero. VEr Vehicle Engine ratio. Initial value is

set at 0.03. VErp "previous" value of VEr from previous iteration. VErp is set dynamically by reading VEr from memory at the start of each iteration before VEr is updated with current values.

Current US Original Classification (1):
701/93

CLAIMS:

20. A method for adapting operation of a vehicle to terrain variation while operating the vehicle on a roadway, the method comprising:

maintaining a cruise set speed for the vehicle;

deriving a vehicle road speed, a vehicle engine speed, a ratio of the vehicle road speed to the vehicle engine speed, a change in vehicle elevation, a grade of the roadway, and a vehicle acceleration from sensors on the vehicle;

determining whether the vehicle's transmission is being shifted;

determining whether a degree of confidence variable should be manipulated by analyzing whether the grade of the roadway is an upward grade, whether the vehicle road speed is lagging behind the cruise set speed, whether the transmission is being shifted, and whether the change in vehicle elevation is greater than a predetermined amount;

when it is determined the degree of confidence variable should be manipulated, analyzing whether the vehicle acceleration has increased over a predetermined amount to determine whether to increment or decrement the degree of confidence variable; and

displaying a message advising manipulation of the cruise control system on a driver-viewable display when the degree of confidence variable exceeds a predetermined threshold.

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Your result set for the last L# is incomplete.

The probable cause is use of unlimited truncation. Revise your search strategy to use limited truncation.

Search Results -

Terms	Documents
L10 and shift$	13

Database:

US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
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Search History

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Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR			
L11	L10 and shift$	13	L11
L10	L9 and down$	23	L10
L9	L6 or L7	41	L9
L8	L6 and L7	34	L8
L7	L5 and @ad<=20021106	41	L7
L6	L5 and @pd<=20021106	34	L6
L5	L1 AND (track$ with speed)	65	L5
L4	L3 AND (track$ with speed)	0	L4
L3	L1 AND L2	4	L3
L2	(477/110).CCLS.	426	L2

L1	(701/93).CCLS.	778	L1

END OF SEARCH HISTORY

L14: Entry 1 of 1 File: USPT May 26, 1998

US-PAT-NO: 5758306
DOCUMENT-IDENTIFIER: US 5758306 A

TITLE: Vehicle cruise control system

DATE-ISSUED: May 26, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nakamura; Hideo	Tokyo			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Nissan Motor Co., Ltd.	Kanagawa			JP	03

APPL-NO: 08/636442 [PALM]
DATE FILED: April 23, 1996

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	7-103859	April 27, 1995
JP	7-309293	November 28, 1995

INT-CL-ISSUED: [06] B60 K 31/04

US-CL-ISSUED: 701/93; 701/54, 701/94, 701/95, 477/107, 180/170
US-CL-CURRENT: 701/93; 180/170, 477/107, 701/54, 701/94, 701/95

FIELD-OF-CLASSIFICATION-SEARCH: 364/426.041, 364/426.042, 364/426.043, 364/424.082, 364/424.083, 364/424.084, 364/424.085, 364/424.094, 477/120, 477/107, 477/108, 477/135, 180/170, 180/179
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5012419	April 1991	Yamamoto	364/426.043
☐	5038880	August 1991	Matsuoka et al.	180/179

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
2-3539	January 1990	JP	
4-39128	February 1992	JP	
4-208646	July 1992	JP	

ART-UNIT: 234

PRIMARY-EXAMINER: Nguyen; Tan Q.

ATTY-AGENT-FIRM: Lowe, Price, LeBlanc & Becker

ABSTRACT:

This invention relates to a vehicle cruise controller which controls engine output and gear shift position such that a detected vehicle speed is identical to a target vehicle speed. A shift to lower gear is performed when a difference between the target vehicle speed and detected vehicle speed reaches a first predetermined value .alpha..sub.1. A mechanism is provided for estimating a travel resistance of the vehicle, the travel resistance when this difference has reached a second predetermined value .alpha..sub.2 which is less than the first predetermined value .alpha..sub.1, being learnt as a maximum drive torque FB of the engine. A shift to higher gear is made when the estimated travel resistance has become less than this learnt maximum drive torque FB after the shift to lower gear. In this way, gear shift hunting during cruise control when the vehicle is climbing or descending slopes, is suppressed.

7 Claims, 50 Drawing figures

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L17: Entry 3 of 4 File: USPT May 26, 1998

DOCUMENT-IDENTIFIER: US 5758306 A
TITLE: Vehicle cruise control system

Detailed Description Text (44):
In a step S19, the absolute value of the difference of the target vehicle speed and real vehicle speed is compared with a second predetermined value .alpha..sub.2. When this absolute value is equal to or less than .alpha..sub.2, it is determined that the target vehicle speed is effectively maintained (travel resistance and drive torque are effectively in equilibrium), and the routine proceeds to a step S21. When this absolute value exceeds .alpha..sub.2, it is determined that the travel resistance is increasing, and the routine proceeds to a step S20. This drive torque also comprises a negative drive torque due to engine braking (=braking torque).

Detailed Description Text (63):
FIGS. 8A-8E show the situation on a descending slope. The descent gradient increases from a point A shown in FIG. 8A. As shown in FIG. 8C, when the vehicle speed difference has reached a predetermined value .alpha..sub.2 at a point B, it is determined that the maximum drive torque in OD (negative drive torque due to engine braking=braking torque) is identical to the travel resistance, hence the travel resistance estimation value Fr is stored as the OD maximum drive torque FB as shown in FIG. 8B. However, if OD cancel occurred at this point, the driver would experience an unpleasant sensation as the vehicle speed difference is still small, so OD is not canceled.

Detailed Description Text (65):
After shifting down to third gear (D3), there is excess braking torque, the vehicle speed difference decreases, and at a point D, the vehicle speed difference decreases to less than .alpha..sub.2.

Detailed Description Text (82):
In a step S109, as in the steps S10-S14 of FIG. 3A, the target drive torque y1 and travel resistance estimation value Fr are computed according to the vehicle speed. The travel load estimation value FR is also calculated by adding the drive torque or braking torque required for acceleration or deceleration to this travel resistance estimation value Fr.

Detailed Description Text (107):
In the step S115, the absolute value of the difference between the target acceleration .alpha.r and the real acceleration .alpha. is compared with a second predetermined value .alpha..sub.B. When the absolute value is equal to or less than this predetermined value .alpha..sub.B, it is determined that the target acceleration .alpha.r is effectively maintained (travel load and drive torque are effectively in equilibrium), and the routine proceeds to a step S116. When this absolute value exceeds the predetermined value .alpha..sub.B, it is determined that the travel resistance is increasing, and the routine proceeds to a step S118. The real acceleration .alpha. used in this computation is obtained from the differential of the real vehicle speed Vsp. The above drive torque also comprises a negative drive torque due to engine braking (=braking torque).

Detailed Description Text (130):
At this point, the cruise control unit 1 determines that the maximum engine braking torque that can be obtained in the OD position has been reached, and the travel load resistance FR including the deceleration is stored as the OD maximum drive torque learning value FB. However if a shift to lower gear were made at this point, the driver would experience an unpleasant sensation as the absolute value of the acceleration difference is still small, so the OD position is maintained at this stage.

Detailed Description Text (132):
At the point D the road gradient becomes constant, and as there is excess engine braking force due to the shift down to third gear, the real acceleration .alpha. gradually returns to the target acceleration .alpha.r.

Detailed Description Text (135):
When deceleration control starts when the vehicle is traveling on a steep descent, it may occur that learning of the OD maximum drive torque learning value FB is never completed. In such a case, the predetermined value Fk which was preset is used instead of the OD maximum drive torque, as in the step S122. This entails a slight loss of control accuracy, however it ensures that a shift to higher or lower gear can be made, that engine braking torque is available depending on the gradient, and that the target acceleration .alpha.r is maintained.

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L11: Entry 12 of 13 File: USPT Aug 22, 1989

US-PAT-NO: 4860210
DOCUMENT-IDENTIFIER: US 4860210 A

TITLE: Method of determining and using a filtered speed error in an integrated acceleration based electronic speed control system for vehicles

DATE-ISSUED: August 22, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
McCombie; Jay C.	West Bloomfield	MI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
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APPL-NO: 07/023165 [PALM]
DATE FILED: March 6, 1987

INT-CL-ISSUED: [04] G06G 7/70, B60K 31/00

US-CL-ISSUED: 364/426.04; 180/176, 180/179, 123/352, 324/160
US-CL-CURRENT: 701/93; 123/352, 180/176, 180/179, 324/160

FIELD-OF-CLASSIFICATION-SEARCH: 364/424, 364/431.07, 364/426.04, 364/565, 180/170, 180/171, 180/174, 180/176, 180/178, 180/177, 180/179, 324/160, 324/161, 324/162, 123/352, 74/866
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
3722614	March 1973	Sakakibara et al.	180/176
3941202	March 1976	Sorkin	364/900
4066874	January 1978	Shaw	180/179
4066876	January 1978	Shaw et al.	180/179
4138723	February 1979	Nehmer et al.	364/565
4219706	August 1980	Koch	200/4

☐	4250854	February 1981	Matsui et al.	123/352	
☐	4335689	June 1982	Abe	123/339	
☐	4335799	June 1982	Shields	180/175	
☐	4336566	June 1982	Noddings et al.	180/178	
☐	4340824	July 1982	Shaw	307/115	
☐	4345663	August 1982	Shields	180/177	
☐	4352403	October 1982	Burney	180/176	
☐	4394739	July 1983	Suzuki et al.	364/426	
☐	4419729	December 1983	Krieder	123/352	
☐	4431077	February 1984	Burney	180/176	
☐	4451888	May 1984	Kuno et al.	364/426	
☐	4451890	May 1984	Suzuki et al.	364/426	
☐	4463822	August 1984	Tanigawa et al.	180/177	
☐	4467428	August 1984	Caldwell	364/426	
☐	4470478	September 1984	Hayashi et al.	180/176	
☐	4472777	September 1984	Youngblood	364/426	
☐	4478184	October 1984	Shinoda et al.	123/352	
☐	4479184	October 1984	Nakano	364/426	
☐	4484279	November 1984	Muto	364/426	
☐	4488527	December 1984	Pfalzgraf et al.	123/399	
☐	4492211	January 1985	Shimomura	123/585	
☐	4501284	February 1985	Kuno et al.	123/352	
☐	4508078	April 1985	Takeuchi	123/339	
☐	4516652	May 1985	Tanigawa et al.	180/177	
☐	4522280	June 1985	Blaney	180/175	
☐	4537272	August 1985	Tanigawa et al.	123/352	
☐	4549266	October 1985	Schneider et al.	364/426	
☐	4553621	November 1985	Hyodo et al.	123/352	
☐	4597465	July 1986	Burney	180/176	
☐	4606425	August 1986	Hayashi et al.	180/177	
☐	4608954	September 1986	Gray	123/352	
☐	4612638	September 1986	Kissel	371/15	
☐	4622636	November 1986	Tachibana	364/404	
☐	4637361	January 1987	Killen et al.	123/339	
☐	4646861	March 1987	Kawata et al.	180/179	
☐	4707792	November 1987	Naitou	180/176	X
☐	4718012	January 1988	Oshiage	364/161	X
	4725969	February 1988	Onogi et al.	180/179	X

☐

☐ 4739485 April 1988 Hayashi 364/431.07

OTHER PUBLICATIONS

SAE Paper No. 830662, by Peter G. Blaney entitled "Improvement to Cruise Controls Utilizing Microprocessor Technology", presented at the International Congress and Exposition in Detroit, Michigan, Feb. 28-Mar. 4, 1983.
Paper entitled "New LSI Circuits that Optimize Cruise Control Systems", by Mark L. Shaw, presented at the INTERNEPCON 1978 Conference.
Chapter entitled "Vehicle Motion Control", pp. 209-230, of Book by Ribbens and Mansour entitled Understanding Automotive Electronics published by Texas Instruments and distributed by the Society of Automotive Engineers (SAE).

ART-UNIT: 234

PRIMARY-EXAMINER: Lall; Parshotam S.

ASSISTANT-EXAMINER: Ramirez; Ellis B.

ATTY-AGENT-FIRM: Calcaterra; Mark P.

ABSTRACT:

Speed error is calculated by finding the difference between set speed and vehicle speed and then filtering the result. The error is tested for polarity and magnitude before selecting a desired acceleration rate. This acceleration rate is used in an acceleration based electronic speed control system for vehicles.

3 Claims, 22 Drawing figures

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L11: Entry 12 of 13 File: USPT Aug 22, 1989

DOCUMENT-IDENTIFIER: US 4860210 A
TITLE: Method of determining and using a filtered speed error in an integrated acceleration based electronic speed control system for vehicles

Application Filing Date (1):
19870306

DATE ISSUED (1):
19890822

Brief Summary Text (17):
U.S. Pat. No. 4,463,822 issued on Aug. 7, 1984, to Tanigawa et al., "Cruise Control System For Automotive Vehicle," discloses an overdrive controller in combination with a cruise control system which will automatically shift the transmission of the vehicle in and out of overdrive in response and in conjunction with the controlling of the speed by the electronic cruise control system.

Brief Summary Text (18):
U.S. Pat. No. 4,467,428 issued on Aug. 21, 1984, to Caldwell, "Automatic Speed Control Systems," discloses a speed control system mainly for heavy duty vehicles which operate mostly on major highways. The disclosure describes a system which anticipates an uphill portion of the highway immediately following a downhill portion of the highway and anticipates the need for an increase throttle action by the heavy equipment vehicle while climbing the hill. Therefore, the system is designed to prevent the loss of momentum obtained by the vehicle as it is descending a hill and use the same momentum in ascending the anticipated following uphill climb.

Brief Summary Text (46):
Should the vehicles' shift selector be bumped from the drive position, while speed control is engaged, the engine speed will run away just as if the clutch were disengaged. Because of this, a Park/Neutral test has been added for automatic transmission versions of this program. If either a neutral or clutch release condition is indicated, a rapid vent (close throttle) pulse will be output and the brake flag BRKSET set to prevent an undesired return to computer control.

Brief Summary Text (86):
A new term, CLOTHR (closed throttle) is also used in the ERCHK subroutine to prohibit speed control from venting down to the minimum throttle position under normal operation. This calibration term is used to prevent low throttle surging.

Brief Summary Text (89):
The large vent (throttle close) pulse, which is output whenever vehicle speed greatly exceeds set speed (e.g., down a steep grade), has been replaced by two large vent pulses which depend on the new terms, VNTAB1 and VNTAB2.

Brief Summary Text (94):
The speed sensor uses the Input Capture 2 (IC2) of the Motorola 6801U4, located in the logic module. This input allows speed sensor timing measurements to 1 usec. resolution. The occurrence of a signal at the IC2 can generate an "interrupt" for

the program execution to update speed sensor information prior to the next sensor toggle. The speed sensor is a switch that makes eight closures per speedometer cable revolution. The closures occur at a rate of 2.222 HZ per MPH. Cable "whip" due to motion of the speedometer cable and differing magnetic pole strengths cause significant closure to closure timing errors. For this reason, closure to closure time is accumulated for one complete cable revolution. This technique seems to dampen any significant timing errors. At 30 mph, it takes about 120 ms. to make 1 cable revolution. A division of the delta time register by 4 prevents an overflow condition of the 16 bit timer accumulator. Speeds as slow as about 15 mph can be calculated without need to keep track of timer overflows. The 4 usec. resolution is still adequate for this application. The program is called via the interrupt structure and provides a minimum of service so as not to significantly delay other engine control processing. First entry into the service routine will cause a copy of the capture value of the free running counter to be saved as a base to calculate closure to closure times. On the next closure, a delta time is calculated, divided by four, and added to the previous delta time calculation. Finally, the old free running counter value is updated with latest value, the interrupt is cleared, the interrupt counter is incremented and the program is returned to its calling point. When the interrupt event counter indicates that a complete revolution has been completed, no further updates will be serviced. The program will return immediately after the event counter is tested and found complete. Thus, the elapsed time for one complete speedometer cable revolution is stored in the delta time register (INTTMR). Both the event counter and the delta time register are reset after the main cruise control module has processed the data into a speed calculation.

Detailed Description Text (17):
Referring now to FIG. 3, a schematic diagram is shown of the speed sensor signal conditioning circuit which is typical of the blocks shown in blocks 58, 60, 62, 64, 66, and 68. For example, shown is the vehicle speed sensor signal from speed sensor 78 being presented to an RC network powered by V.sub.CC. The V.sub.CC voltage is divided down through resistor R76 which, in the preferred embodiment, has a value of 5.1 Kohms. The vehicle speed sensor signal is presented to the juncture of resistor R76 and resistor R125. Resistor R125 has a value of 20 Kohms and is in series with resistor 76 and is connected on its other end to capacitor C126 which has a value of 0.1 Microfarads. The capacitor C126 is connected between resistor R125 and ground potential.

Detailed Description Text (55):
If the set switch 70 is on, the method falls through to block 531 to set the set switch indicator flag (SETFLG) and then to block 352 to increment the set switch timer internal to the microcontroller Z20. The set switch timer is set for 11 msec. of counts. Next, the method falls through to block 534 to check to see whether the set switch 70 has been engaged for a time period greater than a variable called SETIME. The variable SETIME is a stored value in memory of Z51 which is a time period of about 400 msec. beyond which, if the set switch 70 is still engaged, that the electronic speed control system shown in FIG. 1 will interpret that the operator of the vehicle desires to decelerate the vehicle down from the current set speed. The speed of the vehicle coasts down, therefore, decreased by a continuous depression of the set switch 70. If the set switch 70 has been depressed for a time greater than SETIME, the method branches to block 540 to disengage the speed control which acts to decelerate or to coast the vehicle and to reset the speed control. If the set switch 70 has not been depressed for the SETIME, the method falls through to block 600 (to be explained below).

Detailed Description Text (73):
Following block 616, the method branches down to other parts of the routine using VACREG, the desired acceleration (positive) from block 616 to compute the acceleration error.

Current US Original Classification (1):

701/93

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L11: Entry 2 of 13 File: PGPB Nov 28, 2002

DOCUMENT-IDENTIFIER: US 20020177935 A1
TITLE: Tracking and driving speed regulating device for motor vehicles

Abstract Paragraph:
A tracking and driving speed regulating device for motor vehicles, having a sensor device for detecting lane tracking, a steering regulator for evaluating signals from sensor device and for issuing steering commands to a steering actuator, and a speed regulator, acting upon the driving system of the vehicle, which may be switched to an operating state by a main switch and may be activated in the operating state by an actuation signal generated by an operating element, wherein the steering regulator may be switched to the operating state by a separate main switch independent of the speed regulator, and may be activated in the operating state by the same actuation signal as the speed regulator.

Application Filing Date:
20020325

Current US Classification, US Primary Class/Subclass:
701/93

Summary of Invention Paragraph:
[0001] The present invention relates to a tracking and driving speed regulating device for motor vehicles, having a sensor device for monitoring a road track, a steering regulator for analyzing signals of the sensor device and for issuing steering commands to a steering actuator, and having a cruise controller, acting upon the drive system of the vehicle, which can be switched to an operational state using a main switch, and, in the operational state, may be activated by an actuation signal generated by an operating element

Summary of Invention Paragraph:
[0005] German Published Patent Application No. 195 07 957 proposes a tracking and travel speed regulating device, which supports the driver not only in keeping to the desired speed and/or the distance from the preceding vehicle, but also in keeping in lane (LKS=lane keeping support). An optical sensor device is provided for this, with the use of which the spatial position of the vehicle with respect to the lane can be detected, for example, by the use of lane markings. If electronic evaluation of the data detected, using the optical sensor device, indicates that the vehicle is approaching a lateral lane limit, an intervention in the steering of the vehicle is made in such a way that the vehicle is drawn into the middle of the lane. As mentioned in the cited document, this automatic tracking function can be activated and deactivated by the driver in a similar manner, as is the case in the vehicle speed regulating device described at the outset. This tracking function is also automatically deactivated when the driver operates the brake or otherwise actively intervenes in the travel happenings. To be sure, a desirable unloading of the driver is achieved by these various types of automated functions, but on the other hand, along with the increasing number of automated functions, there is also an increase in the appertaining operating elements as well as the number of possible combinations of system states, and it is becoming increasingly more difficult for the driver to keep current at all times on the active or inactive state of the systems or partial systems. In some individual cases this may lead to

misestimations or to irritations which impair the driver's sense of safety, and thus also of the acceptance of such automatic support systems.

Summary of Invention Paragraph:
[0006] It is the object of the present invention to create a tracking and driving speed regulating device which makes a simpler and more lucid operation possible for the driver.

Summary of Invention Paragraph:
[0010] As a matter of preference, the cruise control and the automatic tracking function can also be deactivated by at least one common switch-off signal. An example of such a common switch-off signal is the signal indicated by the operation of the vehicle brakes. It is also expedient to generate a common switch-off signal when the vehicle speed falls below a certain value, such as 40 km/h, below which neither the automatic speed or separation distance regulation nor the automatic tracking function is meaningful. In vehicles having standard shift, operation of the clutch pedal can also trigger a common switch-off signal.

Summary of Invention Paragraph:
[0011] The "cancel" command, by which the speed or separation distance regulation is deactivated, can also be used for deactivating the tracking function. If the constellation of signals leading to the deactivating of the speed or separation distance regulation system is identical to the constellation of signals leading to the deactivating of the tracking function, then the advantage is that the activating conditions are consistent to the driver, that means, he can rely on the fact that, as long as both main switches are switched on, the tracking function is active when, and only when the cruise control function is also active, and vice versa.

Summary of Invention Paragraph:
[0012] In another embodiment, however, special exceptional conditions can be determined, under which the speed and separation distance regulating function on the one hand, and the tracking function on the other hand, can be deactivated independently of each other, so as to take into account special traffic situations. An example of this would be a situation in which the vehicle is proceeding in the left lane of the expressway and the driver ascertains that, far ahead of him, a truck is veering out to overtake somebody. Even if the truck is not yet within radar range, a far-sighted driver will cut his speed early. This can actually be done by the command "set-", without deactivating the regulating systems, but in that case, the multifunctional switch should be held for a prolonged period. Therefore, many drivers prefer giving the command "cancel" to let the vehicle continue to coast until a suitable, lower setpoint speed has been reached. Under these conditions there is no need for also deactivating the tracking function while the vehicle coasts. Something similar applies when the driver wishes to drop further back from the preceding vehicle, in order to permit a traffic participant driving in front of him, to the right, the possibility of cutting into the left lane. One can take account of these situations by additionally making deactivation of the tracking function dependent on the driver's actively operating the gas pedal and/or intervening in the steering, and thereby letting it be known that he himself wants to assume sole control.

Brief Description of Drawings Paragraph:
[0017] FIG. 1 is a block diagram of the tracking and the driving speed regulating device.

Detail Description Paragraph:
[0019] The system illustrated as a block diagram in FIG. 1 includes two control circuits operating largely independently of each other, to be specific, an LKS system (lane keeping support) for automatic tracking of the vehicle, and an ACC system (adaptive cruise control) for regulating driving speed. The ACC system

regulates the driving speed to a setpoint value selected by the driver, as long as the lane ahead of the vehicle is clear. When the vehicle follows a slower one, a switchover is made automatically to a separation distance regulation, using a known transition strategy known per se, in which the distance from the preceding vehicle is regulated to s setpoint value. This setpoint value is a function of the actual speed and of a setpoint time gap, which corresponds to the separation in time at which the preceding vehicle and one's own vehicle passes a fixed point in the lane. This setpoint time gap may be selected by the driver within certain limits, e.g. in a range of 1 to 2 seconds.

Detail Description Paragraph:
[0028] Multifunctional switch 30, which is illustrated separately in FIG. 2, has the shape of a lever positioned at the steering wheel, which can be swiveled up and down to positions "set+" and "set-", as well as forwards and backwards to positions "cancel" and "resume", from a neutral position, and which automatically returns to the neutral position when it is let go. In the example shown, main switches 26 and 28 are designed as push-buttons, and positioned at the free end of multifunctional switch 30 in such a way that they can be operated both independently of one another and together. In response to pressing a push-button (to the right in FIG. 2), main switches 26, 28 catch in their respective on positions, and upon being pressed again, they return to the off position.

CLAIMS:

1. A tracking and driving speed regulating device for a motor vehicle, comprising: a sensor device for detecting lane tracking; a first main switch; a second main switch; a speed regulator for acting upon a driving system of the motor vehicle, the speed regulator being switchable to an operating state by the first main switch and being capable of being activated in the operating state by an actuation signal generated by an operating element; and a steering regulator for evaluating a signal from the sensor device and for issuing a steering command to a steering actuator, the steering regulator being switchable to the operating state by the second main switch independent of the speed regulator and being capable of being activated in the operating state by the actuation signal generated by the operating element.

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L17: Entry 1 of 4 File: PGPB Nov 28, 2002

DOCUMENT-IDENTIFIER: US 20020177935 A1
TITLE: Tracking and driving speed regulating device for motor vehicles

Pre-Grant Publication (PGPub) Document Number:
20020177935

Summary of Invention Paragraph:
[0004] A further development of this cruise control system, also known as "cruise control", is represented by so-called adaptive cruise control (ACC). In such an ACC system, using a radar device, the distance from a preceding vehicle is additionally measured, and, provided there is a vehicle within the detection range of the radar, the regulation is not made based on the preset setpoint speed but rather based on a safe, speed-dependent setpoint distance from the preceding vehicle. Examples of such ACC systems, the use of which can considerably increase travel comfort and safety, are described in German Published Patent Application No. 42 00 694, as well as in Winner et al.: "Adaptive Cruise Control System Aspects and Development Trends", SAE Technical Paper Series 96 1010, 1996, pp 27-36. In these systems it is provided that the regulation of the separation distance is interrupted if the driver intervenes in the driving happenings, for example, by activating the brake.

Summary of Invention Paragraph:
[0005] German Published Patent Application No. 195 07 957 proposes a tracking and travel speed regulating device, which supports the driver not only in keeping to the desired speed and/or the distance from the preceding vehicle, but also in keeping in lane (LKS=lane keeping support). An optical sensor device is provided for this, with the use of which the spatial position of the vehicle with respect to the lane can be detected, for example, by the use of lane markings. If electronic evaluation of the data detected, using the optical sensor device, indicates that the vehicle is approaching a lateral lane limit, an intervention in the steering of the vehicle is made in such a way that the vehicle is drawn into the middle of the lane. As mentioned in the cited document, this automatic tracking function can be activated and deactivated by the driver in a similar manner, as is the case in the vehicle speed regulating device described at the outset. This tracking function is also automatically deactivated when the driver operates the brake or otherwise actively intervenes in the travel happenings. To be sure, a desirable unloading of the driver is achieved by these various types of automated functions, but on the other hand, along with the increasing number of automated functions, there is also an increase in the appertaining operating elements as well as the number of possible combinations of system states, and it is becoming increasingly more difficult for the driver to keep current at all times on the active or inactive state of the systems or partial systems. In some individual cases this may lead to misestimations or to irritations which impair the driver's sense of safety, and thus also of the acceptance of such automatic support systems.

Summary of Invention Paragraph:
[0009] However, in the case of regulation, under the conditions under which the automatic tracking function can be used in a way that makes sense (clearly marked lanes, no crossings, off ramps or sharp curves), suitable assumptions for using the cruise control or (inter-automobile) separation regulating function may be in order. This is true particularly in the case of travel on expressways or country

roads having few curves. In practice, therefore, the two automatic functions ACC and LKS are mostly used together, and under these circumstances, the possibility of activating both systems by using a single command represents a clear improvement in operating comfort. In a typical application, for example, the case of an express highway trip, after accessing the expressway, the driver has to operate the main switch for both systems only once. Then, during the trip, if, for example, both automatic functions were interrupted because of a braking maneuver, one single command, which produces the actuation signal, ensures that both systems are reactivated again, and for example, a situation is avoided where the driver does indeed reactivate the separation distance regulation, but forgets to reactivate the tracking function as well, and then notes with alarm that the vehicle runs out of the lane.

Summary of Invention Paragraph:
[0010] As a matter of preference, the cruise control and the automatic tracking function can also be deactivated by at least one common switch-off signal. An example of such a common switch-off signal is the signal indicated by the operation of the vehicle brakes. It is also expedient to generate a common switch-off signal when the vehicle speed falls below a certain value, such as 40 km/h, below which neither the automatic speed or separation distance regulation nor the automatic tracking function is meaningful. In vehicles having standard shift, operation of the clutch pedal can also trigger a common switch-off signal.

Detail Description Paragraph:
[0022] The ACC system includes as the most important sensor element a speed sensor 16, which measures the actual speed of the vehicle, and at least one radar sensor 18 attached to the front side of the vehicle, with which obstacles ahead of the vehicle, particularly preceding vehicles, can be located. In addition, the distance from the obstacle and the relative speed between the obstacle and one's own vehicle are measured with the aid of radar sensor 18. The radar sensor can possibly also detect the direction of the obstacle, using a certain angular resolution. An electronic data processing unit, here denoted as speed regulator 20, evaluates the data received from speed sensor 16 and radar sensor 18, and intervenes via at least one actuator 22 in the drive system of the vehicle and possibly also in the braking system, so as to regulate the speed of the vehicle. Depending on the type of the engine, actuator 22 acts upon the throttle valve and/or the fuel injection system.

Detail Description Paragraph:
[0027] Furthermore, FIG. 1 shows a number of operating elements and sensors which, together with main switches 26, 28, the warning devices mentioned, as well as warning lights not shown and indicators on the dashboard, belong to the user interface of the system. These operating elements and sensors include particularly a multifunctional switch 30 for operating the speed regulating system, a brake pedal sensor 32, which detects the operation of the brake pedal, and a gas pedal sensor 34, which detects the operated or non-operated state as well as position of the gas pedal. These operating elements have the same functions as in a usual ACC system, but, in the arrangement proposed here, they also act upon the LKS system, so that the strategies for activating and deactivating the LKS and ACC regulating functions are integrated and harmonized.

Detail Description Paragraph:
[0034] The functions of the two control circuits may, however, not be deactivated only by the command "cancel" input by the driver, but also switch themselves off automatically under certain conditions. One of these conditions is satisfied when the driving speed lies below a certain threshold value, such as below 40 km/h. At such low speeds one may assume in general that the travel situation is so unstable that neither ACC regulation nor LKS regulation makes sense. A further condition is the operation of the brake pedal, which is detected with the aid of brake pedal sensor 32. When the driver operates the brake, this generally means that he wishes actively to control the driving situation. Therefore, in this case, too, the

regulating functions are deactivated, until they are activated again by the driver by one of the commands "set+", "set-" or "resume".

Detail Description Paragraph:
[0035] In the example shown, when the speed falls below the speed threshold value, this is detected by threshold value switch 38, whose output signal is combined by an OR-gate 40 with the signal from brake pedal 32 to form a second switch-off signal C. Switch-off signals B and C are supplied to speed regulator 20 via an OR-gate 42. In steering regulator 12, the switch-off signals B and C are supplied to a special switch-off control 44, which makes possible a more differentiated evaluation of these signals, to the extent that this is wanted. In the embodiment currently viewed as preferred, however, switch-off signals B and C are also evaluated in switch-off control 44 in such a way that the LKS regulation is deactivated as soon as one of switch-off signals B or C is present.

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L14: Entry 1 of 1 File: USPT May 26, 1998

DOCUMENT-IDENTIFIER: US 5758306 A
TITLE: Vehicle cruise control system

Detailed Description Text (50):
In the step S24, the absolute value of the travel resistance estimation value Fr computed in the step S12, is compared with the absolute value of the OD maximum drive torque learning stored value FB stored in the step S20. When the absolute value of the travel resistance estimation value Fr is no greater than the absolute value of the OD maximum drive torque learning stored value FB, it is determined that the road gradient has returned to a level at which the target vehicle speed can be maintained in the OD position, and the routine proceeds to a step S25. When this is not the case, the routine proceeds to the step S26.

Detailed Description Text (113):
In the step S121, the absolute value of the travel load estimation value FR computed in the step S109 is compared with the absolute value of the OD maximum drive torque learning stored value FB stored in the step S116. When the absolute value of the travel load estimation value FR is equal to or less than the absolute value of the OD maximum drive torque learning stored value FB, it is determined that the road gradient has returned to a level at which the target acceleration can be maintained in the OD position, and the routine proceeds to a step S123.

Detailed Description Text (137):
In this way, the maximum drive torque that can be obtained in the OD position during cruise control is learnt as the OD maximum drive torque learning value FB. By comparing the absolute value of this OD maximum drive torque learning value FB with the absolute value of the travel load estimation value FR, shifts from the OD position to lower gear and shifts from lower gear up to the OD position are made smoothly under all travel conditions without causing hunting, and cruise control can be continued while performing acceleration and deceleration control as desired.

Refine Search

Search Results -

Terms	Documents
L12 and (accelerat$ and pedal$)	2

Database:

US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L18

Refine Search

Recall Text Clear Interrupt

Search History

DATE: Tuesday, March 21, 2006 Printable Copy Create Case

Set Name side by side	**Query**	**Hit Count**	**Set Name** result set
DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L18	L12 and (accelerat$ and pedal$)	2	L18
L17	L12 and brak$	4	L17
L16	L15 and monitor$	0	L16
L15	L14 and (track$ with speed$)	1	L15
L14	L12 and (compar$ with torque$)	1	L14
L13	L12 and torque$	3	L13
L12	6374173.pn. or 20020177935 or 4870583.pn. or 5758306.pn.	4	L12
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR			
L11	L10 and shift$	13	L11
L10	L9 and down$	23	L10
L9	L6 or L7	41	L9
L8	L6 and L7	34	L8

L7	L5 and @ad<=20021106	41	L7
L6	L5 and @pd<=20021106	34	L6
L5	L1 AND (track$ with speed)	65	L5
L4	L3 AND (track$ with speed)	0	L4
L3	L1 AND L2	4	L3
L2	(477/110).CCLS.	426	L2
L1	(701/93).CCLS.	778	L1

END OF SEARCH HISTORY

L17: Entry 1 of 4   File: PGPB   Nov 28, 2002

PGPUB-DOCUMENT-NUMBER: 20020177935
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020177935 A1

TITLE: Tracking and driving speed regulating device for motor vehicles

PUBLICATION-DATE: November 28, 2002

INVENTOR-INFORMATION:

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FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	DOC-ID	APPL-DATE
DE	101 14 470.9	2001DE-101 14 470.9	March 24, 2001

INT-CL-PUBLISHED: [07] B60 K 31/00

US-CL-PUBLISHED: 701/93; 180/170
US-CL-CURRENT: 701/93; 180/170

REPRESENTATIVE-FIGURES: 1

ABSTRACT:

A tracking and driving speed regulating device for motor vehicles, having a sensor device for detecting lane tracking, a steering regulator for evaluating signals from sensor device and for issuing steering commands to a steering actuator, and a speed regulator, acting upon the driving system of the vehicle, which may be switched to an operating state by a main switch and may be activated in the operating state by an actuation signal generated by an operating element, wherein the steering regulator may be switched to the operating state by a separate main switch independent of the speed regulator, and may be activated in the operating state by the same actuation signal as the speed regulator.

L18: Entry 1 of 2 File: PGPB Nov 28, 2002

DOCUMENT-IDENTIFIER: US 20020177935 A1
TITLE: Tracking and driving speed regulating device for motor vehicles

Pre-Grant Publication (PGPub) Document Number:
20020177935

Summary of Invention Paragraph:
[0003] The input of the set command usually takes place by deflecting the multifunctional switch briefly in the direction (set-). Prolonged holding of the multifunctional switch in the (set-) position has the effect of throttling the vehicle engine and gradually decreasing the speed. As setpoint value for the subsequent cruise control, the speed is then taken over which the vehicle had reached when the switch was let go. As a matter of choice, cruise control can also be activated by deflecting the multifunctional switch briefly in the opposite direction (set+). Prolonged holding of the multifunctional switch in the (set+) position has the effect of increasing the setpoint value, and thus accelerating the vehicle. In this case, too, the speed reached by the vehicle, when the switch is let go, forms the setpoint value for the subsequent regulation. By inputting the command "cancel" the cruise controller is inactivated. However, the most recently valid setpoint value remains stored. By inputting the command "resume" the cruise controller can be reactivated, so that cruise control to the previously stored setpoint value can be resumed. Input of the commands "cancel" and "resume" is usually performed by pulling or pushing the multifunctional switch in the direction at right angles to the directions "set-" and "set+". By switching off the main switch, the regulating system is completely inactivated, and the stored setpoint value is deleted.

Summary of Invention Paragraph:
[0010] As a matter of preference, the cruise control and the automatic tracking function can also be deactivated by at least one common switch-off signal. An example of such a common switch-off signal is the signal indicated by the operation of the vehicle brakes. It is also expedient to generate a common switch-off signal when the vehicle speed falls below a certain value, such as 40 km/h, below which neither the automatic speed or separation distance regulation nor the automatic tracking function is meaningful. In vehicles having standard shift, operation of the clutch pedal can also trigger a common switch-off signal.

Summary of Invention Paragraph:
[0012] In another embodiment, however, special exceptional conditions can be determined, under which the speed and separation distance regulating function on the one hand, and the tracking function on the other hand, can be deactivated independently of each other, so as to take into account special traffic situations. An example of this would be a situation in which the vehicle is proceeding in the left lane of the expressway and the driver ascertains that, far ahead of him, a truck is veering out to overtake somebody. Even if the truck is not yet within radar range, a far-sighted driver will cut his speed early. This can actually be done by the command "set-", without deactivating the regulating systems, but in that case, the multifunctional switch should be held for a prolonged period. Therefore, many drivers prefer giving the command "cancel" to let the vehicle continue to coast until a suitable, lower setpoint speed has been reached. Under

these conditions there is no need for also deactivating the tracking function while the vehicle coasts. Something similar applies when the driver wishes to drop further back from the preceding vehicle, in order to permit a traffic participant driving in front of him, to the right, the possibility of cutting into the left lane. One can take account of these situations by additionally making deactivation of the tracking function dependent on the driver's actively operating the gas pedal and/or intervening in the steering, and thereby letting it be known that he himself wants to assume sole control.

Summary of Invention Paragraph:
[0016] In the known cruise control and ACC systems, the possibility generally exists of briefly disabling the regulation by operating the gas pedal, so that the vehicle accelerates beyond the set setpoint speed. When the gas pedal is released again, the regulation automatically takes over again as soon as the vehicle's speed has declined to the setpoint value. For reasons of consistency, it is expedient, under these conditions, also temporarily to disable the automatic tracking function together with the cruise control, and then to let it start up again synchronously with the cruise control. The driver will make use of the possibility of "flooring" the gas pedal especially when he wants to prepare for a passing procedure. It then makes sense to deactivate the tracking function. An exception may apply for the special case in which the optical sensor device recognizes that the vehicle is already in the left lane. In that case, the flooring of the gas pedal will then, as a rule, only have the effect of abbreviating the passing procedure in order to make it possible for the passed vehicle to cut into the left lane earlier. Under these conditions, it can be provided that the automatic tracking function remains active, by way of exception.

Detail Description Paragraph:
[0027] Furthermore, FIG. 1 shows a number of operating elements and sensors which, together with main switches 26, 28, the warning devices mentioned, as well as warning lights not shown and indicators on the dashboard, belong to the user interface of the system. These operating elements and sensors include particularly a multifunctional switch 30 for operating the speed regulating system, a brake pedal sensor 32, which detects the operation of the brake pedal, and a gas pedal sensor 34, which detects the operated or non-operated state as well as position of the gas pedal. These operating elements have the same functions as in a usual ACC system, but, in the arrangement proposed here, they also act upon the LKS system, so that the strategies for activating and deactivating the LKS and ACC regulating functions are integrated and harmonized.

Detail Description Paragraph:
[0031] The regulating function of speed regulator 20 is activated by swiveling multifunctional switch 30 briefly into position "set+" or "set-" and then letting go. If multifunctional switch 30 is held in position "set+", speed regulator 20 causes acceleration of the vehicle. The vehicle speed reached by the time the switch is let go is then stored as the setpoint speed for the speed regulation. Correspondingly, the command "set-" has the effect of decelerating the vehicle, and here, too, the speed reached by the time the switch is let go is stored as the setpoint value.

Detail Description Paragraph:
[0032] Together with the speed regulating function, the separation distance regulating function is activated at the same time, which is, however, only effective if there is an obstacle or a preceding vehicle in the locating range of radar sensor 18. The ACC regulation is deactivated by pulling multifunctional switch 30 briefly into position "cancel". Switching off the regulation has the result that the vehicle coasts, provided the driver does not step on the accelerator. However, the setpoint value for the speed regulation remains stored until it is replaced by a new setpoint value, or until main switch 28 is switched off. As long as a setpoint value is stored, the command "resume "has the effect

that regulation is resumed to this setpoint value. The three commands "set+", "set-" and "resume" thus have the function of activating the ACC control. This is symbolized in FIG. 1 by combining the signals of multifunctional switch 30, corresponding to these three commands, by an OR-gate 36 to one actuation signal A. The same actuation signal A is also supplied to steering regulator 12, and thus has the effect that the ACC and LKS regulating functions are activated simultaneously, as long as both main switches 26 and 28 are switched on. If only main switch 26 is switched on, actuation signal A activates exclusively the LKS regulation.

Detail Description Paragraph:
[0034] The functions of the two control circuits may, however, not be deactivated only by the command "cancel" input by the driver, but also switch themselves off automatically under certain conditions. One of these conditions is satisfied when the driving speed lies below a certain threshold value, such as below 40 km/h. At such low speeds one may assume in general that the travel situation is so unstable that neither ACC regulation nor LKS regulation makes sense. A further condition is the operation of the brake pedal, which is detected with the aid of brake pedal sensor 32. When the driver operates the brake, this generally means that he wishes actively to control the driving situation. Therefore, in this case, too, the regulating functions are deactivated, until they are activated again by the driver by one of the commands "set+", "set-" or "resume".

Detail Description Paragraph:
[0035] In the example shown, when the speed falls below the speed threshold value, this is detected by threshold value switch 38, whose output signal is combined by an OR-gate 40 with the signal from brake pedal 32 to form a second switch-off signal C. Switch-off signals B and C are supplied to speed regulator 20 via an OR-gate 42. In steering regulator 12, the switch-off signals B and C are supplied to a special switch-off control 44, which makes possible a more differentiated evaluation of these signals, to the extent that this is wanted. In the embodiment currently viewed as preferred, however, switch-off signals B and C are also evaluated in switch-off control 44 in such a way that the LKS regulation is deactivated as soon as one of switch-off signals B or C is present.

Detail Description Paragraph:
[0036] The signal from gas pedal sensor 34 is supplied to both speed regulator 20 and switch-off control 44 in steering regulator 12. However, in speed regulator 20 the signal of gas pedal sensor 34 does not lead to deactivation of the regulating system which can only be reversed by actuation signal A, but only leads to a temporary suspension of the regulating function, as long as the vehicle acceleration requested by the use of the gas pedal is greater than the acceleration called for by actuator 22. This makes it possible for the driver temporarily to exceed the setpoint speed and/or temporarily to enter the separation distance from the preceding vehicle. When the driver releases the gas pedal again, regulation is automatically resumed, and the setpoint value up to the present is used again for speed regulation.

Detail Description Paragraph:
[0037] In the preferred exemplary embodiment, the signal of gas pedal sensor 34 has the same effect on steering regulator 12, i.e., the LKS regulating function is suspended exactly when the ACC regulating function is also suspended. This is of advantage to the driver in that he is not confused by different activating and deactivating schemes for the ACC system and the LKS system. Thus, the driver can rely on the fact that, as long as both main switches 26 and 28 are switched on, either both systems are active or both systems are inactive.

Detail Description Paragraph:
[0038] In the example shown, switch-off control 44 additionally accepts a signal from a turn signal switch 46 and a signal from a torque sensor 48, which specifies the torque applied by the driver upon the steering wheel. The effects of these

signals are analogous, with respect to the LKS system, to the effect of the signal of gas pedal sensor 34. The LKS regulating function is not deactivated, but only suspended temporarily.

Detail Description Paragraph:
[0042] In a modified embodiment, exception strategies may be provided in which the LKS regulation remains active under certain circumstances even when ACC regulation is temporarily deactivated. If the driver enters the command "cancel" because he wishes to assume control himself, he will normally operate the gas pedal himself after a relatively short time. On the other hand, if he leaves the gas pedal unoperated, this indicates that he wishes to use the command "cancel" only for letting the vehicle coast for a longer period of time, in order to clearly reduce speed, and that he will then resume regulation using the command "set" or "resume". One can take account of this constellation by the fact that switch-off signal B leads to deactivating of the LKS regulation only when a signal from gas pedal sensor 34 also arrives after the appearance of switch-off signal B.

Detail Description Paragraph:
[0043] Furthermore, switch-off control 44 can also be designed in such a way that, when the driver operates the gas pedal without having previously entered the command "cancel", the LKS regulation, in contrast to the ACC regulation, is only suspended when a traffic situation detected by sensor device 10 and radar sensor 18 lets it be recognized that a lane change or another active steering intervention by the driver is imminent.

CLAIMS:

5. The regulating device according to claim 3, wherein: the steering regulator is deactivated when one of: the second switch-off signal is present, dependent on an operating condition, and a signal from a gas pedal sensor appears after the first switch-off signal appears, the signal from the gas pedal sensor indicating an operation of the gas pedal.

6. The regulating device according to claim 5, wherein: the signal from the gas pedal sensor temporarily suspends a regulating function in the speed regulator and the steering regulator for a duration of the operation of the gas pedal.

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L17: Entry 1 of 4 File: PGPB Nov 28, 2002

DOCUMENT-IDENTIFIER: US 20020177935 A1
TITLE: Tracking and driving speed regulating device for motor vehicles

Pre-Grant Publication (PGPub) Document Number:
20020177935

Summary of Invention Paragraph:
[0004] A further development of this cruise control system, also known as "cruise control", is represented by so-called adaptive cruise control (ACC). In such an ACC system, using a radar device, the distance from a preceding vehicle is additionally measured, and, provided there is a vehicle within the detection range of the radar, the regulation is not made based on the preset setpoint speed but rather based on a safe, speed-dependent setpoint distance from the preceding vehicle. Examples of such ACC systems, the use of which can considerably increase travel comfort and safety, are described in German Published Patent Application No. 42 00 694, as well as in Winner et al.: "Adaptive Cruise Control System Aspects and Development Trends", SAE Technical Paper Series 96 1010, 1996, pp 27-36. In these systems it is provided that the regulation of the separation distance is interrupted if the driver intervenes in the driving happenings, for example, by activating the brake.

Summary of Invention Paragraph:
[0005] German Published Patent Application No. 195 07 957 proposes a tracking and travel speed regulating device, which supports the driver not only in keeping to the desired speed and/or the distance from the preceding vehicle, but also in keeping in lane (LKS=lane keeping support). An optical sensor device is provided for this, with the use of which the spatial position of the vehicle with respect to the lane can be detected, for example, by the use of lane markings. If electronic evaluation of the data detected, using the optical sensor device, indicates that the vehicle is approaching a lateral lane limit, an intervention in the steering of the vehicle is made in such a way that the vehicle is drawn into the middle of the lane. As mentioned in the cited document, this automatic tracking function can be activated and deactivated by the driver in a similar manner, as is the case in the vehicle speed regulating device described at the outset. This tracking function is also automatically deactivated when the driver operates the brake or otherwise actively intervenes in the travel happenings. To be sure, a desirable unloading of the driver is achieved by these various types of automated functions, but on the other hand, along with the increasing number of automated functions, there is also an increase in the appertaining operating elements as well as the number of possible combinations of system states, and it is becoming increasingly more difficult for the driver to keep current at all times on the active or inactive state of the systems or partial systems. In some individual cases this may lead to misestimations or to irritations which impair the driver's sense of safety, and thus also of the acceptance of such automatic support systems.

Summary of Invention Paragraph:
[0009] However, in the case of regulation, under the conditions under which the automatic tracking function can be used in a way that makes sense (clearly marked lanes, no crossings, off ramps or sharp curves), suitable assumptions for using the cruise control or (inter-automobile) separation regulating function may be in order. This is true particularly in the case of travel on expressways or country

roads having few curves. In practice, therefore, the two automatic functions ACC and LKS are mostly used together, and under these circumstances, the possibility of activating both systems by using a single command represents a clear improvement in operating comfort. In a typical application, for example, the case of an express highway trip, after accessing the expressway, the driver has to operate the main switch for both systems only once. Then, during the trip, if, for example, both automatic functions were interrupted because of a braking maneuver, one single command, which produces the actuation signal, ensures that both systems are reactivated again, and for example, a situation is avoided where the driver does indeed reactivate the separation distance regulation, but forgets to reactivate the tracking function as well, and then notes with alarm that the vehicle runs out of the lane.

Summary of Invention Paragraph:
[0010] As a matter of preference, the cruise control and the automatic tracking function can also be deactivated by at least one common switch-off signal. An example of such a common switch-off signal is the signal indicated by the operation of the vehicle brakes. It is also expedient to generate a common switch-off signal when the vehicle speed falls below a certain value, such as 40 km/h, below which neither the automatic speed or separation distance regulation nor the automatic tracking function is meaningful. In vehicles having standard shift, operation of the clutch pedal can also trigger a common switch-off signal.

Detail Description Paragraph:
[0022] The ACC system includes as the most important sensor element a speed sensor 16, which measures the actual speed of the vehicle, and at least one radar sensor 18 attached to the front side of the vehicle, with which obstacles ahead of the vehicle, particularly preceding vehicles, can be located. In addition, the distance from the obstacle and the relative speed between the obstacle and one's own vehicle are measured with the aid of radar sensor 18. The radar sensor can possibly also detect the direction of the obstacle, using a certain angular resolution. An electronic data processing unit, here denoted as speed regulator 20, evaluates the data received from speed sensor 16 and radar sensor 18, and intervenes via at least one actuator 22 in the drive system of the vehicle and possibly also in the braking system, so as to regulate the speed of the vehicle. Depending on the type of the engine, actuator 22 acts upon the throttle valve and/or the fuel injection system.

Detail Description Paragraph:
[0027] Furthermore, FIG. 1 shows a number of operating elements and sensors which, together with main switches 26, 28, the warning devices mentioned, as well as warning lights not shown and indicators on the dashboard, belong to the user interface of the system. These operating elements and sensors include particularly a multifunctional switch 30 for operating the speed regulating system, a brake pedal sensor 32, which detects the operation of the brake pedal, and a gas pedal sensor 34, which detects the operated or non-operated state as well as position of the gas pedal. These operating elements have the same functions as in a usual ACC system, but, in the arrangement proposed here, they also act upon the LKS system, so that the strategies for activating and deactivating the LKS and ACC regulating functions are integrated and harmonized.

Detail Description Paragraph:
[0034] The functions of the two control circuits may, however, not be deactivated only by the command "cancel" input by the driver, but also switch themselves off automatically under certain conditions. One of these conditions is satisfied when the driving speed lies below a certain threshold value, such as below 40 km/h. At such low speeds one may assume in general that the travel situation is so unstable that neither ACC regulation nor LKS regulation makes sense. A further condition is the operation of the brake pedal, which is detected with the aid of brake pedal sensor 32. When the driver operates the brake, this generally means that he wishes actively to control the driving situation. Therefore, in this case, too, the

regulating functions are deactivated, until they are activated again by the driver by one of the commands "set+", "set-" or "resume".

Detail Description Paragraph:
[0035] In the example shown, when the speed falls below the speed threshold value, this is detected by threshold value switch 38, whose output signal is combined by an OR-gate 40 with the signal from brake pedal 32 to form a second switch-off signal C. Switch-off signals B and C are supplied to speed regulator 20 via an OR-gate 42. In steering regulator 12, the switch-off signals B and C are supplied to a special switch-off control 44, which makes possible a more differentiated evaluation of these signals, to the extent that this is wanted. In the embodiment currently viewed as preferred, however, switch-off signals B and C are also evaluated in switch-off control 44 in such a way that the LKS regulation is deactivated as soon as one of switch-off signals B or C is present.

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L18: Entry 2 of 2 File: USPT Sep 26, 1989

US-PAT-NO: 4870583
DOCUMENT-IDENTIFIER: US 4870583 A

TITLE: Constant speed cruise control system of the duty ratio control type

DATE-ISSUED: September 26, 1989

INVENTOR-INFORMATION:

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APPL-NO: 06/948134 [PALM]
DATE FILED: December 29, 1986

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	60-294224	December 26, 1985
JP	60-294225	December 26, 1985
JP	60-294226	December 26, 1985
JP	60-294227	December 26, 1985
JP	60-294228	December 26, 1985
JP	60-294229	December 26, 1985
JP	60-298125	December 27, 1985
JP	60-298130	December 27, 1985
JP	60-298131	December 27, 1985
JP	60-298132	December 27, 1985
JP	60-298849	December 28, 1985
JP	61-85491	April 14, 1986

INT-CL-ISSUED: [04] G05D 13/58, B60K 31/00

US-CL-ISSUED: 364/426.04; 180/178, 364/162, 364/431.07
US-CL-CURRENT: 701/93; 180/178, 700/42, 701/110

FIELD-OF-CLASSIFICATION-SEARCH: 364/424, 364/426, 364/162, 180/176, 180/177, 180/178, 180/179
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL | Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	2946943	July 1960	Nye et al.	364/162 X
☐	3893537	July 1975	Sakakibara	180/176
☐	4402376	September 1983	Hayashi et al.	364/426 X
☐	4419729	December 1983	Krieder	364/426
☐	4479184	October 1984	Nakano	364/426 X
☐	4484279	November 1984	Muto	364/426
☐	4598370	July 1986	Nakajima et al.	364/426
☐	4723213	February 1988	Kawata et al.	364/426

OTHER PUBLICATIONS

Aylor et al: Design and Application of a Microprocessor PID Predictor Controller, IEEE Transactions on Electronics and Control Instrumentation, vol. IECI-27, No. 3, Aug. 1980, pp. 133-137.
Fishbeck: Writing P-I-D Control Loops Easily in Basic, Control Engineering, vol. 25, No. 10, Oct. 1978, pp. 45-47.
Ribbens et al: Understanding Automotive Electronics, Chapter 8 of Texas Instruments (publication), 1984, pp. 209-225 of Interest.

ART-UNIT: 234

PRIMARY-EXAMINER: Gruber; Felix D.

ATTY-AGENT-FIRM: Wenderoth, Lind & Ponack

ABSTRACT:

A constant speed cruise control system of duty ratio control type for approximating an actual car speed to a stored target car speed, by on/off control of a control valve of an actuator to adjust the throttle valve opening degree by an output duty ratio D obtained from a control line having a gradient showing a conversion characteristic of car speed and duty ratio.

The system has a controller in which

a set duty ratio DS corresponding to the target car speed is calculated as

SD=SD1+(DM-SD1)/n

and the output duty ratio D is calculated as

D=G.times.V+SD

where

G: gradient of control line

V: car speed deviation

DM: integrating element responding quickly to duty ratio change

SD1: integrating element responding slowly to duty ratio change

n: coefficient

and the controller corrects to integrate the set duty ratio SD in a direction of approximating the output duty ratio D.

15 Claims, 63 Drawing figures

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L18: Entry 2 of 2 File: USPT Sep 26, 1989

DOCUMENT-IDENTIFIER: US 4870583 A
TITLE: Constant speed cruise control system of the duty ratio control type

Brief Summary Text (5):
An automotive constant speed cruise control system, known as an Auto-Drive or an automatic speed control, is intended to control the car speed constantly, once a desired car speed is preset, without having to step on the accelerator pedal, and in a generally known system, the coil for a control valve of a negative pressure type actuator used to drive the accelerator link, using an engine negative pressure (e.g. an intake manifold negative pressure, a vacuum pump negative pressure or the like) as a driving source, is driven by a pulse signal of a duty ratio corresponding to the difference between the detected traveling car speed (detected car speed) and the car speed preset by the driver (target car speed).

Brief Summary Text (34):
The leading angle control described above obtains a skip car speed (leading angle car speed) VS by adding the differential value (acceleration) V of the traveling car speed Vn, wherein if Vn changes, VS varies as shown in FIG. 9, so that the change in Vn may be fed back to the output duty ratio D in advance.

Brief Summary Text (64):
In a preferred embodiment, a means for calculating a car acceleration is provided, the low-speed integrating element SD1 and the high-speed integrating element DM are amended in response to a correction value based on the acceleration as the values changes rapidly when the acceleration exceeds a specified value.

Brief Summary Text (85):
In a preferred embodiment, the second means amends the set duty ratio SD as the ratio rapidly changes when a car acceleration exceeds a predetermined limit.

Brief Summary Text (92):
acceleration detecting means for detecting an acceleration of a car;

Brief Summary Text (93):
correction means for adding a correction duty ratio to the output duty ratio D when the acceleration exceeds a specified value.

Brief Summary Text (95):
In a preferred embodiment, the correction means adds to the correction duty ratio increasing in response to the acceleration to the output duty ratio D when the acceleration exceeds the specified value.

Brief Summary Text (96):
In a preferred embodiment, the correction means adds the correction duty ratio increasing in response to elapsing of time to the output duty ratio D when the acceleration exceeds the specified value

Detailed Description Text (39):

The processing performs quick changing DM and SD1 to make car speed change small when car speed acceleration is large, for example when passing from upslope to downslope. That is, if the acceleration .DELTA.Vn exceeds, for example, 1.25 km/h/sec, 4.multidot..DELTA.Vn is subtracted from DM at step s18, and .DELTA.Vn from SD1 at s38. As a result, both DM and SD1 change suddenly. However, since the Vn takes the plus sign when t=accelerating, and the minus sign when decelerating, when the duty ratio is lowered, both DM and SD1 decrease, and when it is increased, both values increase.

Detailed Description Text (73):
The actuator 89 comprises a control valve 89a and a release valve 89b, and the control valve 89a is opened or closed by the control valve coil 89i which is excited by the output of the amplifier 90. then as the control valve coil 89i is energized the atmospheric pressure from port 89c is cut off, and an intake pipe negative pressure from port negative pressure from port 89d is led into a chamber 89e, and when the energization is cut off, the negative pressure form the port 89d is cut off, and the atmospheric pressure form the port 89c is led into the chamber 89e. The release valve 89b is opened and closed by a release valve coil 89j which is driven by the output of a self-holding circuit 92 through an amplifier 91, and when energized, it cuts off the atmospheric pressure form port 89f, and when energization is turned off, it introduces this atmospheric pressure into the chamber 89e. As the pressure in the chamber 89 e is controlled in this way, a diaphragm 89g moves, so that a rod 89h which is linked to an accelerator line (not shown) is mode in the axial direction, thereby controlling the opening degree of throttle valve SL.

Detailed Description Text (108):
FIG. 38 is a block diagram showing the processing strategies of other embodiments of this invention. The car speed signal from the car speed sensor is deprived of noise by passing the same through a car speed filter 184 according to the previously described method, giving a car speed Vn. A set switch 8 is a switch used to set a target car speed VM. The set switch 8 is turned on to read a car speed Vn at that time into a memory 190. The throttle valve is controlled depending on the difference between the target car speed VM and the car speed Vn. In this preferred embodiment, to compensate for the operation delay of an actuator, and the control log due to hysteresis and ply of the throttle and the drive train, the skipped car speed VS is used, where a derivative component .DELTA.V for processing the car speed VN by a differentiator means is added to the car speed VM. The difference signal between the target car speed VM and the skipped car speed VS (VM-VS) is fed to a duty conversion means used to determine the duty ratio for controlling said actuator. Said derivative component .DELTA.V from the differention means is also fed to a distributor means 168 and a corrections means 1780. Using the corrections means 170, corrected values K1 and K2 are determined according to the derivative component .DELTA.V or vehicle acceleration. When using the discrimination means 168, the derivative component .DELTA.V or vehicle acceleration is higher than a specified value (during acceleration conditions) or lower (during deceleration conditions), a switch 172 is thrown on, to fed the corrected values K1 and K2 to the duty ratio conversion means. The duty ratio conversion means is also provided with a control gain VB for duty ratio control and determines a duty ratio D.

Detailed Description Text (109):
FIGS. 39(A) and 39(B) are graphs showing the operation of this preferred embodiment. The control using the conventional system is as indicated by FIG. 39 (A). For instance, in combined use with an automatic transmission, when a vehicle is moving from a level to a uphill road, the duty ratio increases with decreasing speed, but if a small gear ratio is selected, the car speed decreases due to lack of tractive force. When the difference between the target and actual car speeds reaches the specified value, the gear is shifted down. When this occurs, the traction increases and the car accelerates, but at the time of the shiftdown occurring the duty ratio has become considerably large, and it takes time to reduce

the duty ratio to the required value. Hence, the car speed shoots over. In this preferred embodiment, considering that when acceleration (deceleration) is massive, the actual duty ratio is greatly varied from the required duty ratio, the control delay is compensated to prevent overshoot by applying a large correction duty ratio temporarily.

Detailed Description Text (112):
FD: correction duty ratio during acceleration conditions

Detailed Description Text (114):
At step q1, a car speed signal is fed from the car speed sensor, and at step q2, a car speed Vn is determined by the filtering method described above. At step q3, an acceleration .DELTA.V is determined from the difference between the car speed previously determined, V.sub.n-1 and the latest one, Vn. Step q4 is a step provided to determined whether an acceleration is beyond the specified value (1.25 km/h/sec), and when an acceleration is beyond the specified value, th correction duty ratio, FD, is increased in proportion to the acceleration .DELTA.D (FD-FD+K1.multidot..DELTA.D: K1=4). In this preferred embodiment, the processing cycle is 50 msec; for instance, when the acceleration is 1.25 km/h/sec, .DELTA.V is 0.0625 km/h, and hence, the correction amount becomes FD.rarw.FD+4.times.0.0625=FD=0.25. Steps q6 and q7 are provided to set a upper limit .gamma.1 on the correction duty ratio FD, and in this preferred embodiment, the upper limit .gamma.1 of the correction duty ratio FD is set at 20%. When the acceleration is within the specified value (1.25 km/h/sec), the correction duty ratio FD is decreased at step q8 FD-FD-.beta..sub.2 :.beta..sub.2 =5). This decrease in correction duty ratio FD should be done quickly, because when the acceleration is within the specified value (1.25 km/h/sec), the correction duty ratio FD has no longer become necessary, and thus it is advantageous, of control purposes, to refrain from making a correction with the correction duty ratio FD. Steps q9 and q10 are provided to set a lower limit on the correction duty ratio FD to prevent FD from dropping below zero or main an inner correction.

Detailed Description Text (115):
Steps q1 to q17 are steps designed to determine a correction duty ratio FU during deceleration, in contrast with the steps q4 to q10. At q11 is a step used to determine whether an acceleration is below the specified value (-1.23 km/h/sec) (or a deceleration is above the value). In an below is below the thee specified value, a correction duty ratio FU is increase at step q12 depending on the acceleration (FU-FU=K2.multidot..DELTA.V:K2=4). Steps q13 and q14 are given to set an upper limit 2 on the correction duty ratio FU, and in this embodiment, the limit 2 is set at 10%. When an acceleration is out of the specified value (-1.25 km/h/sec), the correction duty ratio FD is decreased at step q15 (FU-FU-.beta..sub.4 :.beta..sub.4 =5) The decrease in the correction duty ratio FU should be as quick as in the case of the correction duty ratio FD. steps q16 and q17 are designed to set a lower limit on the correction duty ratio RU, thereby preventing the correction duty ratio FU from dropping below 0 or making an inverse correction. Step q18 is a step used to determine a skipped car speed VS, performing operations of a car speed Vn and its derivative component .DELTA.V. The, at step q13, a duty ratio D is determined from the aforestated various values in accordance with the equation. At step q20, a duty ration 20 is put out, and is used to control the actuator (step q21).

Detailed Description Text (125):
The resetting coefficients .beta.2 and .beta.4, and the limiting coefficients .gamma.1 and .gamma.2 are constant, while the compensation terms K1.multidot..DELTA.V and K2.multidot..DELTA.V are variables including an acceleration .DELTA.V (K1 and K2 are coefficients), and are used to change FD and FU in proportion to an acceleration .DELTA.V>.

Detailed Description Text (127):
In this embodiment, the correction duty ratios for acceleration and deceleration

are separately processed depending on their characteristics to permit more accurate control.

Detailed Description Text (129):
Unique features of this embodiment are found in a process 178, where the remaining steps, U1 to U3 and U11 to U14 are identical to q1 to q3 and q18 to q21 in FIG. 20, hence they are left unmentioned here. Step U2 is a step used to determine whether an acceleration is plus or minus, i.e., whether the vehicle is being accelerated or decelerated. If it is being accelerated, a correction duty ratio is obtained at step U5 (F.rarw.F+K1 .DELTA.V: K1=4), and the correction duty ratio F is restricted within its upper limit (.gamma.1=20) at steps U6 and U7. If the car is being decelerated, a correction duty ratio F is obtained at step U8 (F.rarw.F+K2.multidot..DELTA.V: K2=4), and the duty ratio F is restricted within its upper limit (.gamma.2=-10) at steps 9 and 10.

Detailed Description Text (131):
and changing a correction duty ratio F in accordance with an acceleration V in the following manner:

Detailed Description Text (137):
The operations in this preferred embodiment, .omega.1 to .omega.4, .omega.5 to .omega.11, and .omega.13 to .omega.21 are not mentioned here since they are identical to q1 to q4, q5 to q11 and q13 to q21 in FIG. 20. The difference between this embodiment and that in FIG. 20 lies in the fact that in the latter correction duty ratios FD and FU are increased or decreased in response to PG,41 acceleration, while in this embodiment they are increased or decreased with time. Expressed in other words, if an acceleration is beyond the specified value .alpha.1 (.alpha.1=1.25 km/h/sec), a correction duty ratio FD is increased in a given amount at step .omega.5 (FD.rarw.FD+.beta.1: .beta.1=0.25). If an acceleration is lower than the specified value 2 (2=-1.25 km/h/sec), a correction duty ratio FU is increased in a specified amount at .omega.2 (FU.rarw.FU+.beta.3:.beta.3=0.25).

Detailed Description Text (149):
In this embodiment, there is no need to determine correction duty ratios FU and FD in proportion to car speeds, thereby achieving a shorter program and smaller memory capacity. Different correction duty ratios FD and FU are applied during acceleration and deceleration conditions, and thus control can be maintained so that it suits their respective characteristics. Although detailed descriptions are omitted, in the preferred embodiment in FIG. 41, the correction amount of a correction duty ratio F can be kept constant, i.e., F.rarw.F+.beta.1 at step U5 and F.rarw.F+.beta.2 at step U8.

Detailed Description Text (154):
In this embodiment, the criterion is the acceleration 1 km/h per 50 msec, therefore, 20 km/h/sec (generally, the limit is about 4 km/h/sec). If a speed change exceeding this standard is detected, the prohibit timer in the processing circuit 188 is set at step z6 to prohibit control in this period, and the prohibition is canceled at steps z7, z9. It means that, if the preset switch 8 in FIG. 10 or FIG. 38 is pressed, data is not stored in the memory 190 or processing circuit 188 (that is, it is cleared). This prohibition of control continues until the prohibit timer expires (for example, 3 seconds), and thereafter the prohibit timer is cleared, and the control mode is set at step z8. As a result, set signal processing is enabled, and when the preset switch 8 is pressed, the output of the car speed filter 184 at that time is stored in the memory 190 and processing circuit 188, and the constant speed traveling control using that output as the target car speed is started at steps z10, z11.

CLAIMS:

6. A constant speed cruise control system according to claim 1, further comprising

a means for determining a car acceleration, and further comprising a means for changing said low-speed integrating element SD1 and said high-speed integrating element DM in response to a correction value based on said determined car acceleration as the values thereof change rapidly when said acceleration exceeds a specified value.

12. A constant speed cruise control system according to claim 9, wherein the second means changes said set duty ratio SD as the ratio rapidly changes when a car acceleration exceeds a predetermined limit.

13. A constant speed cruise control system for maintaining an actual car speed at a stored target car speed by duty ratio control of a control valve which is provided inside an actuator, to which an atmosphere or an engine vacuum is introduced alternatively, comprising:

a car speed sensor and a car speed detecting means for generating a signal in accordance with an actual detected car speed;

a memory means for storing said actual speed detected by said car speed detecting means as the stored target speed in response to manipulation of a set switch;

a means for calculating a set duty ratio SD in accordance with a basic duty ratio in a constant speed control;

a means for calculating a duty ratio in accordance with a difference between said actual car speed and the stored target speed;

a means for actuating the control valve in response to a output duty ratio D which is determined by adding said set duty ratio SD to said duty ratio;

an acceleration detecting means for detecting an acceleration of a car;

a correction means for adding a correction duty ratio to said output duty ratio D when said acceleration exceeds a specified valve.

14. A constant speed cruise control system according to claim 13, wherein said correction means adds said correction duty ratio which is increasing in response to said acceleration to said output duty ratio D when said acceleration exceeds said specified value.

15. A constant speed cruise control system according to claim 13, wherein said correction means adds said correction duty ratio which is increasing in response to the passage of time to said output duty ratio D when said acceleration exceeds said specified value.

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L11: Entry 9 of 13 File: USPT May 26, 1998

US-PAT-NO: 5758306
DOCUMENT-IDENTIFIER: US 5758306 A

TITLE: Vehicle cruise control system

DATE-ISSUED: May 26, 1998

INVENTOR-INFORMATION:

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APPL-NO: 08/636442 [PALM]
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JP	7-103859	April 27, 1995
JP	7-309293	November 28, 1995

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FIELD-OF-CLASSIFICATION-SEARCH: 364/426.041, 364/426.042, 364/426.043, 364/424.082, 364/424.083, 364/424.084, 364/424.085, 364/424.094, 477/120, 477/107, 477/108, 477/135, 180/170, 180/179
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5012419	April 1991	Yamamoto	364/426.043
5038880	August 1991	Matsuoka et al.	180/179

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
2-3539	January 1990	JP	
4-39128	February 1992	JP	
4-208646	July 1992	JP	

ART-UNIT: 234

PRIMARY-EXAMINER: Nguyen; Tan Q.

ATTY-AGENT-FIRM: Lowe, Price, LeBlanc & Becker

ABSTRACT:

This invention relates to a vehicle cruise controller which controls engine output and gear shift position such that a detected vehicle speed is identical to a target vehicle speed. A shift to lower gear is performed when a difference between the target vehicle speed and detected vehicle speed reaches a first predetermined value .alpha..sub.1. A mechanism is provided for estimating a travel resistance of the vehicle, the travel resistance when this difference has reached a second predetermined value .alpha..sub.2 which is less than the first predetermined value .alpha..sub.1, being learnt as a maximum drive torque FB of the engine. A shift to higher gear is made when the estimated travel resistance has become less than this learnt maximum drive torque FB after the shift to lower gear. In this way, gear shift hunting during cruise control when the vehicle is climbing or descending slopes, is suppressed.

7 Claims, 50 Drawing figures

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L11: Entry 9 of 13 File: USPT May 26, 1998

DOCUMENT-IDENTIFIER: US 5758306 A
TITLE: Vehicle cruise control system

Abstract Text (1):
This invention relates to a vehicle cruise controller which controls engine output and gear shift position such that a detected vehicle speed is identical to a target vehicle speed. A shift to lower gear is performed when a difference between the target vehicle speed and detected vehicle speed reaches a first predetermined value .alpha..sub.1. A mechanism is provided for estimating a travel resistance of the vehicle, the travel resistance when this difference has reached a second predetermined value .alpha..sub.2 which is less than the first predetermined value .alpha..sub.1, being learnt as a maximum drive torque FB of the engine. A shift to higher gear is made when the estimated travel resistance has become less than this learnt maximum drive torque FB after the shift to lower gear. In this way, gear shift hunting during cruise control when the vehicle is climbing or descending slopes, is suppressed.

Application Filing Date (1):
19960423

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Brief Summary Text (5):
Tokkai Hei 2-3539 published by the Japanese Patent Office in 1990 discloses a system wherein the automatic transmission is shifted to lower gear when the vehicle speed falls from a target speed outside a predetermined range, and is shifted to higher gear when it is determined that the vehicle is not climbing a slope. This determination is made by comparing values of the road gradient estimated from the engine load and vehicle speed before and after a shift to lower gear.

Brief Summary Text (6):
Tokkai Hei 4-208646 published by the Japanese Patent Office in 1992 discloses a system wherein, when the throttle opening has decreased from its maximum value by a predetermined amount after a shift to lower gear, there is a shift to higher gear.

Brief Summary Text (7):
Tokkai Hei 4-39128 published by the Japanese Patent Office in 1992 applies fuzzy theory to determine whether or not the engine has reached steady state running conditions based on the engine throttle opening after there has been a shift to lower gear. There is then a shift to higher gear when the amount whereby the throttle opening has decreased after the vehicle has reached steady state running conditions, is equal to or greater than a predetermined value.

Brief Summary Text (8):
However according to Tokkai Hei 2-3539, there is a shift to higher gear after it is has been determined that the vehicle is not climbing a slope, so the vehicle tends to run at a lower gear than necessary. Further the throttle opening prior to a shift to lower gear includes an opening corresponding to the acceleration required to cancel a difference between the target speed and actual speed in order to

maintain the actual speed. Still further, the road gradient may increase even more while the real vehicle speed is falling out of the predetermined range. There may therefore be a considerable error in the estimated value of the road gradient prior to the shift to lower gear. As a result, when it has been decided to shift to higher gear by comparing with this estimated value of road gradient, the target vehicle speed may not be maintained after the shift, then there is another shift to lower gear, and hunting occurs.

Brief Summary Text (9):
In the case of Tokkai Hei 4-208646, it is decided to shift to higher gear based on the amount by which the throttle has decreased after a shift to lower gear, however the variation of throttle opening and variation of drive torque are not in linear proportion to one another. Consequently when it is decided to shift to higher gear according to the decrease of throttle opening it may occur, depending on engine running characteristics and running conditions, that the target vehicle speed cannot be maintained after the shift to higher gear, so there is again a shift to lower gear and hunting occurs. Further, when for example the road gradient increases while the vehicle is accelerating due to increase of indicated speed so that it becomes difficult to reach the target speed, it may occur that a smooth shift to lower gear cannot be made.

Brief Summary Text (10):
According to Tokkai Hei 4-39128, after a shift to lower gear, a shift to higher gear is made when the engine running conditions have reached a steady state and the throttle opening has decreased by a predetermined amount, however, it is not determined whether or not the road gradient at this time can maintain the target vehicle speed after the shift to higher gear. Further, the variation of throttle opening and variation of drive torque are not proportional as stated hereintofore. There is therefore a possibility that hunting may occur.

Brief Summary Text (14):
In order to achieve the above objects, this invention provides a vehicle cruise control system comprising a mechanism for setting a target vehicle speed, a mechanism for detecting a vehicle speed, a mechanism for adjusting an output of an engine, a mechanism for changing-over a gear shift position, a mechanism for controlling the adjusting mechanism and changing-over mechanism such that a detected vehicle speed is identical to the target vehicle speed, a mechanism for computing a difference between the target vehicle speed and detected vehicle speed, a mechanism for commanding the changing-over mechanism to shift to lower gear position when an absolute value of the difference has reached a first predetermined value .alpha..sub.1, a mechanism for estimating a travel resistance Fr of the vehicle, a mechanism for learning the estimated travel resistance Fr as a maximum drive torque FB of the engine when the difference has reached a second predetermined value .alpha..sub.2 which is less than the first predetermined value .alpha..sub.1, and a mechanism for commanding the changing-over mechanism to shift to higher gear position when an absolute value of the estimated travel resistance Fr has become less than an absolute value of the learned maximum drive torque FB after the shift to lower gear position.

Brief Summary Text (15):
It is preferable that the system further comprises a mechanism for determining whether or not the learning mechanism has completed learning the maximum drive torque FB, and a mechanism for commanding the changing-over mechanism to shift to higher gear position when an absolute value of the travel resistance Fr has become less than a predetermined value Fk in case the learning is not complete.

Brief Summary Text (16):
It is also preferable that the system further comprises a mechanism for detecting an output of the engine, and that the estimating mechanism is provided with a vehicle model specifying a relation between the vehicle speed and engine output

when the vehicle is traveling on a flat track, a mechanism for computing, from the vehicle model, an engine output required to generate the detected vehicle speed, and a mechanism for deriving the travel resistance Fr from a difference between the computed engine output and detected engine output.

Brief Summary Text (17):
This invention also provides a vehicle cruise control system comprising a mechanism for setting a target vehicle speed, a mechanism for detecting a vehicle speed, a mechanism for adjusting an output of an engine, a mechanism for changing-over a gear shift position, a mechanism for controlling the adjusting mechanism and changing-over mechanism such that a detected vehicle speed is identical to the target vehicle speed, a mechanism for detecting a vehicle acceleration, a mechanism for modifying the target vehicle speed according to a predetermined target acceleration, a mechanism for estimating a travel resistance Fr of the vehicle, a mechanism for computing a travel load FR based on the vehicle acceleration and travel resistance Fr, a mechanism for computing a difference between the target acceleration and the detected acceleration, a first commanding mechanism for commanding the changing-over mechanism to shift to lower gear position when the absolute value of the difference has reached a first predetermined value .alpha..sub.A, a mechanism for learning the travel load FR as a maximum drive torque FB of the engine when the absolute value of the difference has reached a second predetermined value .alpha..sub.B which is less than the first predetermined value .alpha..sub.A, and a second commanding mechanism for commanding the changing-over mechanism to shift to higher gear position when an absolute value of the estimated travel resistance Fr has become less than an absolute value of the learned maximum drive torque FB after the shift to lower gear position.

Brief Summary Text (18):
It is preferable that the system further comprises a mechanism for detecting an output of the engine, and that the estimating mechanism is provided with a vehicle model specifying a relation between the vehicle speed and engine output when the vehicle is traveling on a flat track, a mechanism for computing, from the vehicle model, an engine output required to generate the detected vehicle speed, and a mechanism for deriving the travel resistance Fr from a difference between the computed engine output and detected engine output.

Brief Summary Text (19):
It is also preferable that the first commanding mechanism commands a shift to lower gear position based on the difference of acceleration when the modifying mechanism is modifying the target vehicle speed, and commands a shift to lower gear position based on a difference between the target vehicle speed and detected vehicle speed when the modifying mechanism is not modifying the target vehicle speed.

Brief Summary Text (20):
It is also preferable that the system further comprises a mechanism for determining whether or not the learning mechanism has completed learning the maximum drive torque FB, and a mechanism for commanding the changing-over mechanism to shift to higher gear position when an absolute value of the travel resistance Fr has become less than a predetermined value Fk in case the learning is not complete.

Drawing Description Text (14):
FIGS. 12A-12G are diagrams showing variations of road slope, target acceleration, travel resistance estimation value, travel load estimation value, real acceleration, real vehicle speed and shift position on an ascending slope during acceleration control, according to the second embodiment.

Drawing Description Text (15):
FIGS. 13A-13G are diagrams showing variations of road gradient, target acceleration, travel resistance estimation value, travel load estimation value, real acceleration, real vehicle speed and shift position when acceleration control

is released on a rising slope, according to the second embodiment.

Drawing Description Text (16):
FIGS. 14A-14G are diagrams showing variations of road gradient, target acceleration, travel resistance estimation value, travel load estimation value, real acceleration, real vehicle speed and shift position on a descending slope during deceleration control, according to the second embodiment.

Drawing Description Text (17):
FIGS. 15A-15G are diagrams showing variations of road gradient, target acceleration, travel resistance estimation value, travel load estimation value, real acceleration, real vehicle speed and shift position when deceleration control is released on a descending slope, according to the second embodiment.

Detailed Description Text (24):
C1(z.sup.-1), C2(z.sup.-1) are disturbance estimators in the zero approximation method which suppress the effect of disturbance and modeling errors. C3(z.sup.-1) is a compensator in the model matching method which is set so that the response characteristics of the object under control when the target vehicle speed in input and the real vehicle speed is output, coincides with the characteristics of a standard model H(z.sup.-1) having a predetermined first order delay and an ineffectual time, as shown in FIG. 4B. The disturbance estimators shown in FIG. 4A estimate the travel resistance (required drive torque) necessary to maintain the target vehicle speed. In computing the target engine torque, a gear ratio is chosen according to the shift position such that a travel resistance estimation value Fr is not affected by the shift position.

Detailed Description Text (43):
In a step S18, it is determined whether or not the shift position of the automatic transmission is OD. When it is OD, the routine proceeds to a step S19, and when it is not OD, the routine proceeds to a step S23. The determination of this shift position is performed by a LO/HI level of the signal line 41 which indicates the OD shift situation of the automatic transmission.

Detailed Description Text (47):
In the step S21, the absolute value of the difference of the target vehicle speed and real vehicle speed is compared with the first predetermined value .alpha..sub.1. When this absolute value is equal to or greater than the predetermined value .alpha..sub.1, it is determined that there should be a shift to lower gear and the routine proceeds to a step S22. When the absolute value is less than the predetermined value .alpha..sub.1, the routine proceeds to a step S26.

Detailed Description Text (48):
In the step S22, an OD cancel flag is set, and the automatic transmission is requested to shift to lower gear from OD.

Detailed Description Text (57):
As the vehicle continues to climb the slope, at a point C when the gradient has increased to a predetermined angle, the vehicle speed difference has reached .alpha..sub.1, it is determined that the vehicle speed cannot be maintained in this shift position, and a decision is made to shift to lower gear.

Detailed Description Text (58):
After shifting down to third gear, there is excess drive torque, so the throttle opening is decreased as shown in FIG. 7E. The vehicle speed also decreases, and at a point D, the vehicle speed difference falls below .alpha..sub.2 as shown in FIG. 7C.

Detailed Description Text (61):
After the travel resistance estimation value Fr has decreased to less than the OD

maximum drive torque learning stored value FB at the point F, it is determined that the road gradient has returned to a level at which the target vehicle speed can be maintained in the OD position, and a decision is made to shift to higher gear.

Detailed Description Text (62):
In this way, it is detected without fail that the road gradient has returned to a level at which the target vehicle speed can be maintained in the OD position, so large decelerations on steep slopes are prevented and shift hunting is definitively avoided.

Detailed Description Text (64):
As the vehicle continues to descend, the vehicle speed difference reaches the predetermined value .alpha..sub.1 at a point C when the gradient has reached a predetermined angle, so a decision is made to shift to lower gear as shown in FIG. 8D.

Detailed Description Text (65):
After shifting down to third gear (D3), there is excess braking torque, the vehicle speed difference decreases, and at a point D, the vehicle speed difference decreases to less than .alpha..sub.2.

Detailed Description Text (68):
After the travel resistance estimation value Fr has increased to higher than the OD maximum drive torque learning stored value FB, it is determined that the road gradient has returned to a level at which the target vehicle speed can be maintained in the OD position, and a decision is made to shift to higher gear.

Detailed Description Text (69):
In this way, it is detected without fail that the road gradient has returned to a level at which the target vehicle speed can be maintained in the OD position, so large accelerations on steep descents are prevented and shift hunting is definitively avoided.

Detailed Description Text (71):
In the aforesaid step S24, it was assumed that .vertline.travel resistance estimation value.vertline..ltoreq..vertline.learned value.vertline., however if hysteresis is introduced when there is a shift to higher gear after a shift down by setting .vertline.travel resistance estimation value.vertline..ltoreq..vertline.learned value.vertline.+.beta., shift hunting can be avoided even more definitively.

Detailed Description Text (106):
In the step S114, it is determined whether or not the automatic transmission is set to the OD position. When it is in the OD position, the routine proceeds to a step S115. When it is not in the OD position, the routine proceeds to a step S120. The shift position of the automatic transmission is determined by a LO/HI level of the signal line 41 showing its OD shift status.

Detailed Description Text (109):
Herein, the second predetermined value .alpha..sub.B is set to a smaller value than a predetermined value .alpha..sub.A described hereinafter, the travel load estimation value FR in the travel state before the shift to lower gear based on this predetermined value .alpha..sub.B is stored as the OD maximum drive torque learning stored value FB, and a learning complete flag is set to 1 in a step S117.

Detailed Description Text (110):
In the step S118, the absolute value of the difference of the target acceleration .alpha.r and the real acceleration .alpha. is compared with the first predetermined value .alpha..sub.A. When this absolute value is equal to or greater than the predetermined value .alpha..sub.A, it is determined that there should be a

shift to lower gear and the routine proceeds to a step S119. When the absolute value is less than the predetermined value .alpha..sub.A, the routine proceeds to a step S124.

Detailed Description Text (111):
In the step S119, the OD cancel flag is set to 1, and the automatic transmission is requested to shift to lower gear from OD.

Detailed Description Text (114):
In the step S123, the OD cancel flag is reset to 0, and a request is issued to shift up to OD.

Detailed Description Text (115):
When the absolute value of the travel load estimation value FR is greater than the absolute value of the OD maximum drive torque learning stored value FB, the OD cancel flag is maintained in its set state, and the routine proceeds to a step S124 while the current shift down position is maintained.

Detailed Description Text (116):
When the learning complete flag is not 1 in the step S120, the routine proceeds to the step S122, and the absolute value of the travel load estimation value FR computed in the step S109 is compared with a predetermined value Fk preset in storage means such as a ROM, not shown. When the absolute value of the travel load estimation value FR is equal to or less than the predetermined value Fk, it is determined that the road gradient has returned to a level at which the target acceleration can be maintained in the OD position. In this case, the OD cancel flag is reset to 0 in the step S123, and a request is issued to shift up to OD. When the absolute value of the travel load estimation value FR is greater than the predetermined value Fk, the OD cancel flag is maintained in its set state, and the routine proceeds to a step S124 while the current shift down position is maintained. The predetermined value Fk corresponds to the maximum drive torque in the OD position preset according to the state of the vehicle.

Detailed Description Text (118):
Subsequently, a request is issued to shift to higher gear, shift to lower gear or maintain shift position by setting an interface register corresponding to the signal line 43 to the automatic transmission control unit based on the OD cancel flag, in a step S125.

Detailed Description Text (119):
As a result of the aforesaid control, even when the travel resistance (road gradient) increases during acceleration control or deceleration control, and the target acceleration .alpha.r cannot be maintained, a suitable shift from OD to lower gear takes place without causing shift hunting.

Detailed Description Text (121):
At this point it is determined that the maximum drive torque attainable in the OD shift position has been reached, and the travel load estimation value FR including an acceleration (shown in FIG. 12D) is stored as the OD maximum drive torque learning value FB.

Detailed Description Text (123):
However if a shift from OD to lower gear were made at this point, the driver would experience an unpleasant sensation as the acceleration difference is still small, so the OD position is maintained at this stage.

Detailed Description Text (124):
A shift from the OD position to lower gear is made only at a point D at which the absolute value of the difference between the real acceleration .alpha. and target acceleration .alpha.r has further increased to .alpha..sub.A. Herein, a shift down

is made to third gear (D3) as shown in FIG. 12G.

Detailed Description Text (125):
Also the road gradient becomes constant from the point D, there is excess drive torque due to the shift down to third gear, and the real acceleration .alpha. returns to the target acceleration .alpha.r.

Detailed Description Text (126):
The road gradient gradually decreases from a point E, and at a point F, the absolute value of the computed travel load estimation value FR falls so that it is equal to or less than the absolute value FB of the OD maximum drive torque learning value FB which was stored at the point C. At this point, the vehicle's cruise control unit 1 determines that the target acceleration .alpha.r can be maintained even if there were a shift up to OD, and a command is issued to shift up to the OD position.

Detailed Description Text (127):
When acceleration control starts when the vehicle is traveling on a steep slope, it may occur that learning of the OD maximum drive torque learning value FB is never completed. In such a case, the predetermined value Fk which was preset is used instead of the OD maximum drive torque, as in the step S122. This entails a slight loss of control accuracy, however it ensures that a shift to higher or lower gear can be made, that drive torque is available depending on the gradient, and that the target acceleration .alpha.r is maintained.

Detailed Description Text (128):
Assuming that acceleration control starts from a point A and is disengaged at a point E midway on a rising slope as shown in FIGS. 13A-13G, as the target acceleration .alpha.r is 0 at the point E where acceleration control is released, the travel load estimation value FR=the travel resistance Fr, and the travel load resistance estimation value FR becomes less than the OD maximum drive torque learning value FB stored at the point C. In this case, as in the case of the aforesaid first embodiment, it is determined that the road gradient has returned to a level at which the target vehicle speed Vspr can be maintained, a shift up to OD is made, and cruise control is continued.

Detailed Description Text (130):
At this point, the cruise control unit 1 determines that the maximum engine braking torque that can be obtained in the OD position has been reached, and the travel load resistance FR including the deceleration is stored as the OD maximum drive torque learning value FB. However if a shift to lower gear were made at this point, the driver would experience an unpleasant sensation as the absolute value of the acceleration difference is still small, so the OD position is maintained at this stage.

Detailed Description Text (131):
At a point D where the absolute value of the difference between the real acceleration .alpha. and the target acceleration .alpha.r has increased to the first set value .alpha..sub.A, a shift from the OD position down to third gear (D3) is made.

Detailed Description Text (132):
At the point D the road gradient becomes constant, and as there is excess engine braking force due to the shift down to third gear, the real acceleration .alpha. gradually returns to the target acceleration .alpha.r.

Detailed Description Text (133):
From a point E, the road gradually becomes a flat track, and at a point F, the absolute value of the travel load resistance FR becomes equal to or less than the OD maximum drive torque learning value FB stored at the point C. As a result, the

cruise control unit 1 determines that the target acceleration .alpha.r can be maintained even if there were a shift up to OD, so there is a shift up to the OD position and deceleration continues.

Detailed Description Text (134):
Shifts to higher and lower gear are therefore performed smoothly without causing shift hunting even under deceleration control during cruise control.

Detailed Description Text (135):
When deceleration control starts when the vehicle is traveling on a steep descent, it may occur that learning of the OD maximum drive torque learning value FB is never completed. In such a case, the predetermined value Fk which was preset is used instead of the OD maximum drive torque, as in the step S122. This entails a slight loss of control accuracy, however it ensures that a shift to higher or lower gear can be made, that engine braking torque is available depending on the gradient, and that the target acceleration .alpha.r is maintained.

Detailed Description Text (136):
In FIGS. 15A-15G, deceleration control starts from a point A as in FIGS. 14A-14G. When deceleration control is disengaged at a point E midway on a descending slope, the target acceleration .alpha.r is 0 at the point E where deceleration control is released. As a result, the travel load estimation value FR=the travel resistance Fr, and the absolute value of the travel load resistance estimation value FR becomes less than the OD maximum drive torque learning value FB stored at the point C. In this case, as in the case of the aforesaid first embodiment, the cruise control unit 1 determines that the road gradient has returned to a level at which the target vehicle speed Vspr can be maintained, a shift up to OD is made, and cruise control is continued.

Current US Original Classification (1):
701/93

CLAIMS:

1. A vehicle cruise control system comprising:

means for setting a target vehicle speed,

means for detecting a vehicle speed,

means for adjusting an output of an engine,

means for changing-over a gear shift position,

means for controlling said adjusting means and changing-over means such that a detected vehicle speed is identical to said target vehicle speed,

means for computing a difference between said target vehicle speed and detected vehicle speed,

means for commanding said changing-over means to shift to lower gear position when an absolute value of said difference has reached a first predetermined value .alpha..sub.1,

means for estimating a travel resistance Fr of said vehicle,

means for learning said estimated travel resistance Fr as a maximum drive torque FB of said engine when said difference has reached a second predetermined value .alpha..sub.2 which is less than said first predetermined value .alpha..sub.1. and

means for commanding said changing-over means to shift to higher gear position when an absolute value of said estimated travel resistance Fr has become less than an absolute value of said learned maximum drive torque FB after said shift to lower gear position.

2. A vehicle cruise control system as defined in claim 1, further comprising means for determining whether or not said learning means has completed learning said maximum drive torque FB, and means for commanding said changing-over means to shift to higher gear position when an absolute value of said travel resistance Fr has become less than a predetermined value Fk in case said learning is not complete.

4. A vehicle cruise control system comprising:

means for setting a target vehicle speed,

means for detecting a vehicle speed,

means for adjusting an output of an engine,

means for changing-over a gear shift position,

means for controlling said adjusting means and changing-over means such that a detected vehicle speed is identical to said target vehicle speed,

means for detecting a vehicle acceleration,

means for modifying said target vehicle speed according to a predetermined target acceleration,

means for estimating a travel resistance Fr of said vehicle,

means for computing a travel load FR based on the vehicle acceleration and travel resistance Fr,

means for computing a difference between said target acceleration and said detected acceleration,

first commanding means for commanding said changing-over means to shift to lower gear position when the absolute value of said difference has reached a first predetermined value .alpha..sub.A,

means for learning said travel load FR as a maximum drive torque FB of said engine when the absolute value of said difference has reached a second predetermined value .alpha..sub.B which is less than said first predetermined value .alpha..sub.A, and

second commanding means for commanding said changing-over means to shift to higher gear position when an absolute value of said estimated travel resistance Fr has become less than an absolute value of said learned maximum drive torque FB after said shift to lower gear position.

6. A vehicle cruise controller as defined in claim 4, wherein said first commanding means commands a shift to lower gear position based on said difference of acceleration when said modifying means is modifying said target vehicle speed, and commands a shift to lower gear position based on a difference between the target vehicle speed and detected vehicle speed when said modifying means is not modifying said target vehicle speed.

7. A vehicle cruise system as defined in claim 4, further comprising means for

determining whether or not said learning means has completed learning said maximum drive torque FB, and means for commanding said changing-over means to shift to higher gear position when an absolute value of said travel resistance Fr has become less than a predetermined value Fk in case said learning is not complete.

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L11: Entry 11 of 13 File: USPT Sep 26, 1989

DOCUMENT-IDENTIFIER: US 4870583 A
TITLE: Constant speed cruise control system of the duty ratio control type

Application Filing Date (1):
19861229

DATE ISSUED (1):
19890926

Brief Summary Text (22):
Suppose cruising is maintained with an actual car speed in complete agreement with the target value under a particular condition, and that the target speed varies stepwise by a factor of B. Another way of saying this is that to the target car speed V(S) is given B/S, and the target value X(S) transmitted to the feedback system tracks the variation path and converges into V(S) as depicted in FIG. 5. On the contrary, the actual car speed Y(S) varies as in FIG. 5. The final value of the deviation Z(S) between X(S) and Y(S) is given by: ##EQU3##

Brief Summary Text (35):
However, if the car speed changes suddenly due to abrupt variations of the road surface or shift-down of an automatic transmission car, a sufficient controllability (response) is hard to obtain, partly because of the effects of the car speed filter (integrating filter).

Detailed Description Text (15):
DM is a high-speed integrating element which will quickly respond to changes in the duty ration, thereby reducing the set deviation. It operates on the principle that as illustrated in FIG. 12(A), the control line is made to rotate at high car speeds so that the deviation is decreased. On the contrary, SD1 is a low-speed integrating element which will respond slowly to changes in duty ratio and decrease the set deviation. Its operation strategy is to shift the control line in a parallel fashion in the direction of decreasing the deviation as indicated in FIG. 12(B).

Detailed Description Text (16):
For both DM and SD1, the initial value is equivalent to SD.sub.0 in Eq. 2, and traces the path against the changes in duty ratio D as shown in FIGS. 13(A) and 13 (B). FIG. 13(A) is an illustration of the operations when there is a drop in the speed of a car moving from a level to a uphill road (the duty ratio increased, while FIG. 13(B) illustrates the operation including a downhill. As shown in FIG. 13(A), when duty ratio D varies with varying car speeds, both DM and SD1 initiate changes. But since DM responds more quickly of the two, DM first follows up. SD1 later starts change, so that the overall SD1 changes like dashed line, and then merges with duty ratio D. This is because SD shifts from SD.sub.0 to D=A, where the equation 6 becomes stabilized when V=0, and SD=A.

Detailed Description Text (59):
Another way of saying this is that the target car speed V(S) is given at B/S, and the target value X(S) transmitted to the feedback system tracks the variation path and converges to V(S) as depicted in FIG. 23. On the contrary, an actual car speed Y(Y) varies as in FIG. 23, but the final value of the deviation Z(S) between X(S)

and Y(S) is given by: ##EQU6##

Detailed Description Text (103):
The pulse cycle Ti* can be determined from the step r1 to r9 in the flowchart in FIG. 36. Each pulse of the car speed signal is used as an interruption signal. The process is interrupted (at step r1) every time the rise of an edge of the car speed signal pulse is sensed, and the interruption time is read and the time data previously read and stored are shifted one by one (step r2, r3, r4, r5 and r6). Expressed in other words, the processing circuit, which is comprised of a central processing unit (CPU), a timer connected to the CPU through a bus line, a random access memory (RAM), a read only memory (ROM) and other devices, reads the interruption time into the CPU register in response to the clock pulse from the time each time interruption conditions are set out (at step r1). The last fifth to preceding time data (interruption time) stored in each address from N+ 4th to 4th in the RAM is rotated one after another; the time data most recently picked up is stored in the Nth address as the latest time, thereby performing processes r2 through r6. The pulse cycle Ti is calculated (step 7) by subtracting the last fifth time data registered in the N=rth address of the RAM from the last one stored in the Nth address. Using the preceding pulse cycle filter value T*.sub.i-1 and the latest cycle value Ti, the latest filtered pulse synchronization value T*.sub.i-1 is computed (step r8) with the equation 22 (1=4), and stored into the specified address. This filtered pulse synchronization value Ti is determined and updated at each rising of a car speed pulse signal, maintaining the latest pulse cycle filtered value Ti in a specified address of RAM. At the completion of the computation of the pulse cycle filtered values, this interruption process is put to an end and the main process is resumed (step r9).

Detailed Description Text (109):
FIGS. 39(A) and 39(B) are graphs showing the operation of this preferred embodiment. The control using the conventional system is as indicated by FIG. 39 (A). For instance, in combined use with an automatic transmission, when a vehicle is moving from a level to a uphill road, the duty ratio increases with decreasing speed, but if a small gear ratio is selected, the car speed decreases due to lack of tractive force. When the difference between the target and actual car speeds reaches the specified value, the gear is shifted down. When this occurs, the traction increases and the car accelerates, but at the time of the shiftdown occurring the duty ratio has become considerably large, and it takes time to reduce the duty ratio to the required value. Hence, the car speed shoots over. In this preferred embodiment, considering that when acceleration (deceleration) is massive, the actual duty ratio is greatly varied from the required duty ratio, the control delay is compensated to prevent overshoot by applying a large correction duty ratio temporarily.

Current US Original Classification (1):
701/93

L11: Entry 11 of 13 File: USPT Sep 26, 1989

DOCUMENT-IDENTIFIER: US 4870583 A
TITLE: Constant speed cruise control system of the duty ratio control type

Application Filing Date (1):
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DATE ISSUED (1):
19890926

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and Y(S) is given by: ##EQU6##

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Detailed Description Text (109):

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Current US Original Classification (1):

701/93

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L11: Entry 1 of 13 File: PGPB Feb 13, 2003

DOCUMENT-IDENTIFIER: US 20030033073 A1
TITLE: Vehicle brake control system

Application Filing Date:
20020717

Current US Classification, US Secondary Class/Subclass:
701/93

Summary of Invention Paragraph:
[0005] The following paragraph describes operation of a system given a congestion tracking function, in which the application region of the known ACC system is extended to a lower speed region during congestion, when a preceding vehicle is repeatedly stopping and starting.

Detail Description Paragraph:
[0047] Input into the interface circuit 22 of the EPB ECU 21 is a signal from the ACC system ECU 1, together with various signals relating to the degree of opening of an accelerator, a shift position, a brake control signal, etc. from external ECUs such as a fuel injection system, an automatic transmission, an anti-lock brake system, and a vehicle stability assist system. The electric motor drive circuit 25 is connected to the electric motor 30, the electromagnetic brake drive circuit 26 is connected to an electromagnetic brake 33, which will be described below, and the lamp drive circuit 27 is connected to lamps such as a brake alarm lamp, an operation lamp, a mode display lamp, and a stop lamp.

Detail Description Paragraph:
[0076] When the electric parking brake device 12 is actuated and generates braking forces in the wheel brakes 11, if the electric motor 30 or its control system fails, since the electric parking brake device 12 cannot be released by the electric motor 30, it is necessary for the electric parking brake device 12 to be manually released by an occupant. For this purpose, as shown in FIG. 9, the hexagonal wrench 80 is inserted into the hexagonal hole 75a of the rotating shaft 75, and the rotating shaft 75 is pushed down to a second position against the biasing force of the coil spring 78, so that the drive bevel gear 79 of the rotating shaft 75 is meshed with the driven bevel gear 84 of the screw shaft 47.

Detail Description Paragraph:
[0077] With this movement, the rear end of the lever 82 whose middle part is supported by the pin 81 is pushed down, thereby raising the forward end thereof, so that the releasing member 72 connected to the forward end thereof rises between the plate 66 and the armature 67. As a result, as shown in FIG. 10, the inclined surfaces 71b; 71c of the releasing member 72 ride on the inclined surfaces 67a; 67b of the armature 67, and the plate 66 and the armature 67 therefore become detached from the rotor 65 against the biasing force of the first coil springs 68, so that the electromagnetic brake 33 is manually released without exciting the coil 63.

Detail Description Paragraph:
[0084] That is, the main CPU 23 of the EPB ECU 21 determines the necessity of actuation of the electric parking brake device 12 based on, for example, the

inclination of a road surface detected by the inclination sensor 29e, the longitudinal acceleration detected by the longitudinal acceleration sensor 29f, the wheel speed detected by the wheel speed sensor 29g, the master cylinder pressure of the hydraulic brake system detected by the master cylinder pressure sensor 29h, the operational state of the brake pedal detected by the brake switch 29i; and the degree of opening of the accelerator, the shift position, the idle stop, and the brake control signal that have been input from external ECUs. As one example of the determination, when the wheel speed detected by the wheel speed sensor 29g is 0, the degree of opening of the accelerator input from the external ECU is 0, and the brake switch 29i is on, it is determined that automatic actuation of the electric parking brake device 12 is required, and in step S5 the electric parking brake device 12 is actuated. When determining the necessity of actuation of the electric parking brake device 12, the inclination of the road surface detected by the inclination sensor 29e can be taken into consideration, and if the road surface is flat it may be determined that automatic actuation of the electric parking brake device 12 is needed.

Detail Description Paragraph:
[0088] Firstly, in step S21 initial diagnoses of the preceding vehicle detection means 2, the brake actuator 3, the throttle actuator 4, etc. are carried out. After that, in step S22 a signal from a switch for allowing operation of the ACC system is captured, and if in step S23 operation of the ACC system is allowed, in step S24 a following distance from a preceding vehicle detected by the preceding vehicle detection means 2 is calculated. If, in step S25, it is determined that the tracking control (constant following distance control) is unnecessary because of the following distance being large, in step S26 cruise control (constant vehicle speed control) is carried out at a set vehicle speed. If, in step S25, it is determined that tracking control is necessary because of the following distance being small, in step S27 a necessary target acceleration/deceleration is calculated in order to make the following distance coincide with a set following distance.

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L11: Entry 11 of 13 File: USPT Sep 26, 1989

US-PAT-NO: 4870583

DOCUMENT-IDENTIFIER: US 4870583 A

TITLE: Constant speed cruise control system of the duty ratio control type

DATE-ISSUED: September 26, 1989

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Nagasaka; Masumi	Toyota			JP

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NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
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APPL-NO: 06/948134 [PALM]

DATE FILED: December 29, 1986

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JP	60-298125	December 27, 1985
JP	60-298130	December 27, 1985
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US-CL-CURRENT: 701/93; 180/178, 700/42, 701/110

FIELD-OF-CLASSIFICATION-SEARCH: 364/424, 364/426, 364/162, 180/176, 180/177, 180/178, 180/179
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected | Search ALL | Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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☐	4402376	September 1983	Hayashi et al.	364/426 X
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☐	4479184	October 1984	Nakano	364/426 X
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Fishbeck: Writing P-I-D Control Loops Easily in Basic, Control Engineering, vol. 25, No. 10, Oct. 1978, pp. 45-47.
Ribbens et al: Understanding Automotive Electronics, Chapter 8 of Texas Instruments (publication), 1984, pp. 209-225 of Interest.

ART-UNIT: 234

PRIMARY-EXAMINER: Gruber; Felix D.

ATTY-AGENT-FIRM: Wenderoth, Lind & Ponack

ABSTRACT:

A constant speed cruise control system of duty ratio control type for approximating an actual car speed to a stored target car speed, by on/off control of a control valve of an actuator to adjust the throttle valve opening degree by an output duty ratio D obtained from a control line having a gradient showing a conversion characteristic of car speed and duty ratio.

The system has a controller in which

a set duty ratio DS corresponding to the target car speed is calculated as

SD=SD1+(DM-SD1)/n

and the output duty ratio D is calculated as

D=G.times.V+SD

where

G: gradient of control line

V: car speed deviation

DM: integrating element responding quickly to duty ratio change

SD1: integrating element responding slowly to duty ratio change

n: coefficient

and the controller corrects to integrate the set duty ratio SD in a direction of approximating the output duty ratio D.

15 Claims, 63 Drawing figures

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L2: Entry 1 of 1 File: USPT May 26, 1998

DOCUMENT-IDENTIFIER: US 5758306 A
TITLE: Vehicle cruise control system

Detailed Description Text (44):
In a step S19, the absolute value of the difference of the target vehicle speed and real vehicle speed is compared with a second predetermined value .alpha..sub.2. When this absolute value is equal to or less than .alpha..sub.2, it is determined that the target vehicle speed is effectively maintained (travel resistance and drive torque are effectively in equilibrium), and the routine proceeds to a step S21. When this absolute value exceeds .alpha..sub.2, it is determined that the travel resistance is increasing, and the routine proceeds to a step S20. This drive torque also comprises a negative drive torque due to engine braking (=braking torque).

Detailed Description Text (63):
FIGS. 8A-8E show the situation on a descending slope. The descent gradient increases from a point A shown in FIG. 8A. As shown in FIG. 8C, when the vehicle speed difference has reached a predetermined value .alpha..sub.2 at a point B, it is determined that the maximum drive torque in OD (negative drive torque due to engine braking=braking torque) is identical to the travel resistance, hence the travel resistance estimation value Fr is stored as the OD maximum drive torque FB as shown in FIG. 8B. However, if OD cancel occurred at this point, the driver would experience an unpleasant sensation as the vehicle speed difference is still small, so OD is not canceled.

Detailed Description Text (65):
After shifting down to third gear (D3), there is excess braking torque, the vehicle speed difference decreases, and at a point D, the vehicle speed difference decreases to less than .alpha..sub.2.

Detailed Description Text (82):
In a step S109, as in the steps S10-S14 of FIG. 3A, the target drive torque y1 and travel resistance estimation value Fr are computed according to the vehicle speed. The travel load estimation value FR is also calculated by adding the drive torque or braking torque required for acceleration or deceleration to this travel resistance estimation value Fr.

Detailed Description Text (107):
In the step S115, the absolute value of the difference between the target acceleration .alpha.r and the real acceleration .alpha. is compared with a second predetermined value .alpha..sub.B. When the absolute value is equal to or less than this predetermined value .alpha..sub.B, it is determined that the target acceleration .alpha.r is effectively maintained (travel load and drive torque are effectively in equilibrium), and the routine proceeds to a step S116. When this absolute value exceeds the predetermined value .alpha..sub.B, it is determined that the travel resistance is increasing, and the routine proceeds to a step S118. The real acceleration .alpha. used in this computation is obtained from the differential of the real vehicle speed Vsp. The above drive torque also comprises a

negative drive torque due to engine braking (=braking torque).

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DOCUMENT-IDENTIFIER: US 5758306 A
TITLE: Vehicle cruise control system

Detailed Description Text (65):
After shifting down to third gear (D3), there is excess braking torque, the vehicle speed difference decreases, and at a point D, the vehicle speed difference decreases to less than .alpha..sub.2.

Detailed Description Text (130):
At this point, the cruise control unit 1 determines that the maximum engine braking torque that can be obtained in the OD position has been reached, and the travel load resistance FR including the deceleration is stored as the OD maximum drive torque learning value FB. However if a shift to lower gear were made at this point, the driver would experience an unpleasant sensation as the absolute value of the acceleration difference is still small, so the OD position is maintained at this stage.

Detailed Description Text (132):
At the point D the road gradient becomes constant, and as there is excess engine braking force due to the shift down to third gear, the real acceleration .alpha. gradually returns to the target acceleration .alpha.r.

Detailed Description Text (135):
When deceleration control starts when the vehicle is traveling on a steep descent, it may occur that learning of the OD maximum drive torque learning value FB is never completed. In such a case, the predetermined value Fk which was preset is used instead of the OD maximum drive torque, as in the step S122. This entails a slight loss of control accuracy, however it ensures that a shift to higher or lower gear can be made, that engine braking torque is available depending on the gradient, and that the target acceleration .alpha.r is maintained.